Profiles

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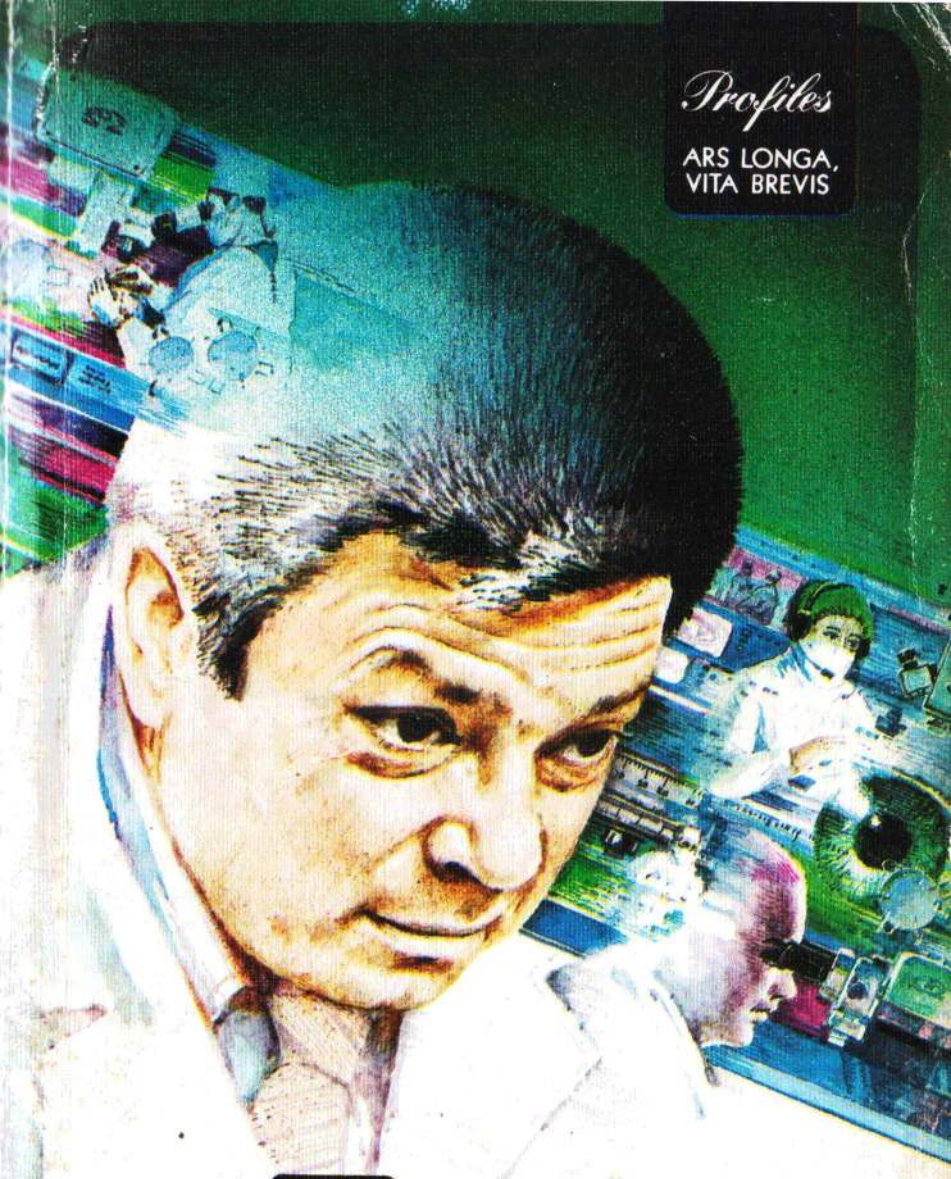

JUST A MAGICIAN
WHO GIVES
BACK SIGHT

Svyatoslav Fyodorov

Sergei VLASOV

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Svyatoslav Fyodorov

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Foreword

"Arzen, saddle the horses," Fyodorov cried out to his nephew as he stepped out of the car; removing his jacket as he came across.

Eleven-year-old Arzen had been waiting for that minute all day and was off like a flash. A few minutes later two fine steeds stood at the gate, beating their hooves on the ground and shaking their heads. Fyodorov, in T-shirt and breeches, hurried to his pets.

Arzen was already installed astride Shah, as if born on horseback. Fyodorov mounted Grom. With whoops of joy, they disappeared round a bend. I was left alone at the dacha. A long summer day lingered and I enjoyed the quiet after the day-time noise of Moscow. I felt glad to be alone and brood upon that man, Svyatoslav Fyodorov, the famous eye surgeon.

I have known him 15 years. I was struck by his temperament the first time we met. As the years go by (and he is sixty now), he seems to gain more and more strength and energy. He does everything he lays hand to with gusto. With gusto he rides, sees to a new clinic being built, invents new instruments and medical techniques. With gusto he swims, hunts, drives his car, makes his operations, speaks, socialises, reads lectures, argues, lives.

Where did he get that quality?

Conveyer-Belt Patients?

A medical acquaintance of mine once flung a fretful question at me: "Why are you writing so much about Fyodorov? He has no heart. A doctor will not operate on eyes on a conveyer-belt unless he's got a piece of ice instead of a heart. Just think: eyes and a conveyer-belt. Horrible. The two things can never go together."

I have heard that many times. I must admit that when

Fyodorov told me about his conveyer-belt project for the first time, it shocked me. The notion was so outrageous.

"That's too much, Svyatoslav. The idea of a conveyer-line patient doesn't seem quite human."

"And is it human to keep patients on the waiting list for years?" he bristled.

We never broached the subject again. Two years later I entered an operating theatre denoted: "Automated Rehabilitative Line".

The room looked mysterious, like a factory unit manufacturing some unknown product. Silvery walls, ceiling and floor... The quiet noise of opening and closing partitions through which moved operating tables with patients. They moved from one surgeon to another, their surgery done bit by bit.

Each operation is divided into several stages, one surgeon for each stage. Patients are operated on under an individual scheme. Before surgery, they undergo a thorough examination, and the computer chooses the best scheme for the case. The scheme is fixed at the head of the operating table so that each surgeon knows what to do. Where conveyer-belt surgery is inadvisable a patient is operated on by only one surgeon.

In the pre-surgery stage, patients are told by experts in psychology what is going to happen. This is to dispel inevitable fears.

The operating room is filled with pleasant music. A patient can hear nothing but the music, nor even the remarks of the surgeons who talk with one another using mini-microphones at their lips and ear-pieces. The patient cannot see the unnerving instruments either, as only the sick eye remains open. In other words, all factors that might arouse fear are eliminated.

After the operation, patients are given a light meal and then relax in comfort, listening to music.

So far conveyer-belt surgery has been used to treat cataracts, glaucoma and myopia. Other operations are to be performed in the future.

The complications rate in "conveyer-belt patients" has dropped almost by nine-tenths as compared with conventional methods of treatment. This is due to a brand-new principle in world medicine whereby each surgeon checks the work of his predecessor. He will not begin his part of the work unless he is satisfied that his colleague coped well at the previous stage.

The most difficult part of the operation is performed by the most skilled surgeon and he is responsible for the work of the

whole team. A team operates on patients whom they have examined before and will attend after surgery.

In myopia surgery, Professor Fyodorov has deemed it necessary to place a first-class specialist in the last but one stage of the operation to check the quality of the other surgeons' work. He actually gets down to surgery if he sees that the cuts on the cornea are not long or deep enough. The point is that myopia surgery, known as radial keratotomy, consists in making several radial cuts on the external surface of the cornea, which changes its elastic properties. Under the internal eye pressure, the area of the cornea with cuts on it becomes convex, the central part remaining flat. As a result, the focus is restored to where it should be, that is the retina.

The first attempts to remove myopia through corneal incisions were made in 1953 by Japanese eye specialist Dr. Sato. He cut the cornea from inside and along the extreme periphery. But the results of his operations were so discouraging (one patient in three lost eyesight) that he had to abandon the technique.

But the idea behind it lived on to be given a new lease of life in Moscow.

Professor Fyodorov suggested making deeper cuts and on the exterior surface of the cornea. The central eye zone and the optical axis were left intact. Professor Fyodorov found a mathematical relationship between the required acuity of vision and the number, length and depth of cuts. The new technique was thoroughly developed at his clinic. It was divided into five stages and placed on the "conveyer-belt". Up to 150 patients can undergo surgery in this way every day.

Professor Fyodorov has this to say to specialists who consider his technique premature:

"To my mind, they don't have sufficient knowledge of our operations. We've been making them at the clinic for 13 years now. We have operated on over 25,000 patients, and in 97 per cent of the cases we've achieved very positive results, that is the restoration of visual acuity to 70 or even 100 per cent. None of the patients under post-operative observation has suffered a myopic relapse."

The conveyer-belt technique makes it possible to increase the number of operations fivefold. Professor Fyodorov says: "Forty rehabilitative lines like ours can provide effective eye surgery to all those who need it in this country. The main thing for me is to restore eyesight to as many people as possible and to do it in the best possible way. It doesn't matter how this is going to be

achieved—by the conveyer-belt technique or any other 'inhuman' method, even though many of my colleagues feel resentment. The main thing is to do as much good and for as many people as possible. All the rest is empty talk."

That is the kind of person he is, strong and purposeful.

Reluctant to Talk of His Past

Fyodorov was born in the Ukrainian town of Proskurov (now Khmelnitsky) in 1927. His father, assistant commander of a cavalry regiment, heard the news late as he was away on manoeuvres. Airmen dropped him the message: "It's a boy. Congratulations."

One early impression which has remained with Fyodorov all his life, was the warm breathing of a horse and its shimmering velvety nostrils. His father was fond of horses and could talk about them endlessly. The same love developed in Fyodorov junior.

He was a sickly boy. At six or seven he looked like a four-year-old. He was an avid reader and could read several books at a time. Without finishing one book, he took to reading another and still another, and then got back to the first. He borrowed books from several libraries. There was always a pile of newly started books on his desk.

After he got through each new book, he tried to imitate its heroes. At one time he wanted to emulate d'Artagnan. Later he became a devoted fan of Jack London's heroes, courageous, strong-willed people who took chances to do good. For a long time he was an admirer of Harnish, the hero of the novel *Burning Daylight*.

He has always liked characters who are daring and enterprising in pursuit of a noble goal. High-minded adventurism has been part of his nature since he was a boy. Something of the musketeers' valour and ardour seems to have lodged in him. He relishes bold action, even a kind of debonair prowess. It does not appear to matter to him what people might be saying about him.

Professor Fyodorov's father, Nikolai Fyodorov. The late 1920s.

Svyatoslav Fyodorov aged 3.

When the war* broke out, he was 14 years old. He asked to be taken into the army but, quite naturally, was turned down. Somehow, he got himself a gun and a little ammunition, and was planning to run off to the partisans. But his plans did not work. In October 1941 enemy forces approached Rostov-on-Don. The Fyodorovs were then living in Novocherkassk, not far from Rostov. They were evacuated to the Caucasus area. The train in which they were travelling was bombed several times but Svyatoslav kept sticking his head out the window to see where the bombs were landing. His mother kept pulling him in. The train was not hit but the one following behind was totally destroyed.

The family settled down in the mountainous community of Tsakhkadzor, Armenia. Those were hungry days. His father away at the front, Svyatoslav had to provide for his mother and younger sister. He got hold of a small-bore rifle and began hunting wild pigeons and ducks. That was some food. Once he decided to go wolf-hunting, and that with a small-bore rifle. He

* The Soviet people's Great Patriotic War of 1941-45 against Nazi Germany and its allies.

lay in ambush for six nights, but no wolf came by, for better or worse.

As a boy, he dreamed of becoming an air pilot. As soon as the Nazis were driven out of Rostov, he enrolled at flying school but never became a pilot.

In March 1945, a misfortune occurred which dramatically changed his life. There was to be a party at school. Svyatoslav put on his best suit. He was short for time and had to hurry. He ran after a tram, jumped, missed the step, grabbed the handrail, and was thrown off his feet. He tried to regain balance but instead found himself under the wheels. A sharp pain shot through his left foot.

He was taken to hospital and the doctors had to amputate his left foot and part of the shin.

Svyatoslav was in hospital when the war came to an end in 1945. He knew there was no returning to flying school. The question was what career to pursue. Many of his friends enrolled at polytechnical or railway engineering institutes. He was thinking of following suit, but he hated drawing and in general monotony. So he decided against a technical career. Should he opt for the humanities? For that, thought Svyatoslav, a person had to have a flair for literature and other arts.

Perhaps, medicine? No, medicine was for ladies, so he had always thought, and he wanted a man's profession for himself. But there were no other institutes in Rostov. So he had to settle for medicine. Simply speaking, it was a forced decision.

When he came to the institute with his documents, they did not believe that he was 18 years old. "You must be still in school," they told him.

When I asked Professor Fyodorov about his past, he was not too willing to recall it. But touch on present problems or plans and ideas, and he spoke with zeal.

At one time he told me: "There's no yesterday for me." Then I took it for a jarring bravado. One can't but learn from past mistakes, I thought. It is only human to fret over things you did wrong.

Now I realise that he is not that kind of person. Fyodorov lives by his ideas and projects for the future. His philosophy is not to relive the past but to search for something new. Though some may find it unacceptable, we should not judge him out of hand. Thoughts about the past would be too heavy ballast for a person who seems to live in the future. Perhaps, they would have him hamstrung. Who knows?

First Love

In his second year at institute, Svyatoslav fell in love. Her name was Valya and she was studying at Novocherkassk Polytechnic. He used to go there from Rostov to see her every weekend. He would travel by bus from the railway station in Novocherkassk, but there were no buses in the evening and he had to foot it six or seven kilometres across the town to catch the last train home.

Once Valya told him: "I could fall in love only with a strong man but you..."

He was no Hercules, for sure. Two pull-ups was the best he could do on the bar. Her words hurt him and he plunged into body-building. He got hold of a one-pood* lump of iron and would lift it to exhaustion. Again and again, he did pull-ups and handstands. He set himself a three-month deadline to give his body an athletic look.

The three months went by and he learned that Valya had come to Rostov and had left without seeing him. He felt insulted and promised himself not to see her another three months and build up impressive muscles.

He did change. A short time later he could do twenty push-ups with the iron. He could not just stand on his hands—he could dance on them.

Anticipating victory, he went to see her. But his acquired muscle power proved no use. In the intervening six months Valya had fallen in love with another man.

He felt so hurt at being rejected.

But his efforts had not been in vain. He had gained control over his body and there was no returning to his previous lifestyle. Weight-lifting and gymnastics became part of his life. In a year and a half he had grown eight centimetres. He had trained his body so that he could roll naked in snow. He was insured against cold, flu and sore throats.

A short while later he took to swimming. He obtained a book on swimming and would take it with him to the other bank of the Don. In one month he learned all swimming styles.

One day, for interest's sake, he raced against swimmers

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* An old Russian measure equaling 36 lb.

training in the river, leaving many of them behind. The coach noticed him and said:

"Look here, there's going to be a three-kilometre heat here on the Don. We are short of one man. Will you race for us?"

"I've never raced before."

"You just make it to finish, that's all."

"All right," Svyatoslav agreed, feeling proud of being singled out.

On the morning of the race, it suddenly turned cold. There was a strong wind churning up the river. He was the last to leap into the water. His only thought was how to make it to the end. Then he raised his head and saw three others ahead of him. He overtook one, then another. There was one more ahead but that was a good swimmer who had never lost before. Professor Fyodorov recalls:

"I felt so angry. Suddenly, I wanted to beat him. Three hundred metres or so before the finish I outdid him and to my infinite surprise won the race. There was a crowd on the embankment, clapping their hands and shouting something—I didn't

. Braving the cold in 1953.

hear what. I was deaf with emotion. It felt so nice to realise that I could do things that others couldn't. That minute I realised for the first time that I could do a lot. I now knew that if a person could overcome himself, he could overcome any problem. There, on the bank of the Don, I became confident in myself. Perhaps, that is the main quality in me. As I stood there, dripping wet, I discovered a simple but exceptionally important truth: one had to work hard to succeed. For me that victory, however modest and insignificant, was a starting point in life. Though it might sound paradoxical and sacrilegious, I do believe that I was lucky to have lost my foot. Otherwise, I might never have developed the urge for activity, the willpower or the ability to remain true to the lofty goal that I now have."

So he won. He was awarded a watch, and a Rostov newspaper carried a brief story about him. He was capped to swim for the institute and the *Medik* sports society. Soon he became the Rostov student swimming champion.

Once Svyatoslav bet a friend two months' student pay that he would cross the Don forty times on end. He turned up at the appointed time but his friend never came, apparently for fear of losing the bet. At that place the river was some 250 metres wide. Forty times that distance made ten kilometres.

"That's What I Want"

As a student, he was never a particular success or failure. Hardly any of his co-students could guess that Slavka, as everyone used to call him,* would rise "so high" in the world. He kept away from large company, perhaps because one had to chip in to go to a party, and he was always short of money.

Indeed, those were pretty hard times for him. In the evenings, he worked as an electrician. Then he took up photography. He borrowed a camera from his neighbour and learned the technique from books.

When the time came to specialise, he opted for ophthalmology. The human eye resembled the camera he was so fond of. The lens and the cornea looked like a photographic lens, and the retina like a film. His hobby helped him to choose his road in medicine.

* A diminutive or pejorative form from Svyatoslav.

He also liked ophthalmology for being so precise. A person's eyesight could be determined not in vague terms like "good" or "bad" but percentage points: 100 per cent, 20 per cent, or 70 per cent.

Professor Fyodorov has always liked mathematics and other exact sciences and desisted from vague explanations. And he appreciates preciseness and clarity in other people. He himself draws on precise mathematical criteria whenever he can.

When he came to his first class in ophthalmology, he immediately realised: "That's what I want." But his first experience with eye surgery was quite traumatic.

He watched the removal of an eye. He closely followed the operation when he suddenly felt sick, running out of the room just in time.

"How can I be an eye surgeon after that?" he thought when he regained self-control. "I must get used to it and control my emotions."

He made his first operation in March 1951. The patient, a factory worker, had a tiny piece of metal stuck into his eye. Assistant Professor Lakshin was the surgeon and Fyodorov was to assist him. But Lakshin only administered the anaesthetic and then turned to Fyodorov:

"You do the rest."

For the first time Fyodorov cut an eye, brought a magnet to the incision and felt the metal piece get stuck to it. Now, 35 years since that operation, Professor Fyodorov still remembers the light click with which that piece of metal hit the magnet.

Scandal Is a Good Thing

So Fyodorov dreamed of becoming an air pilot but became a surgeon. He has never regretted it. His life has been a flight into the future.

The Institute of Eye Microsurgery under his charge is state-of-the-art. Hardly had the conveyer-belt controversy subsided when he made plans to build a robot surgeon.

Once he phoned me late at night:

"I was at an exhibition of robotics in Sokolniki* today and

* An amusement park in Moscow, the site of international industrial exhibitions.

came to terms with a Finnish company. They will help us develop a robot for surgery to correct myopia."

"Aren't you tired of being told that you're dehumanising medicine?"

"I'm doing nothing of the kind. Medicine is dehumanised by those who make the surgeon repeat the same monotonous manipulations day in, day out. A surgeon must think and invent. Why does he have to do muscle work like cutting and stitching? He should intervene only at a critical moment when his knowledge and brain power are needed. Nowadays a doctor has to be an all-round specialist and personality. He must be well versed in biology, mathematics, chemistry, physics and cybernetics, and he needs time for that. He can have that time if he's freed from monotonous work. That's what I need robots for."

That he is again going to be run down by his colleagues for indulging in pipedreams and showing a "cavalier attitude" to medicine does not embarrass him in the least. In fact, it eggs him on. He likes to disturb the peace.

"Scandal is such a good thing," Professor Fyodorov once said. "Scandal immediately accentuates opinions and puts the spotlight on a problem or innovation. Opinions are exchanged and decisions made more quickly in an acute situation. A small scandal can solve a small problem, and a large scandal can solve a large problem. Often I try to wind up my colleagues on purpose. And I keep telling my younger colleagues: 'Don't be afraid of hotting things up. A conflict situation is necessary for the progress of science. Certainly, your views must be based on sound logic. In this case you can win and overcome a barrier of mistrust.'"

Several years ago I asked him:

"If you'd been more diplomatic, you might have achieved even more. Don't you think so?"

Professor Fyodorov replied:

"I don't think so at all. In that case I'd still be operating on monkeys. I've been told again and again: you have to wait for distant results. How long, I asked. Fifteen or twenty years, they said. Now where's the logic? If no harm has occurred two, three or five years after surgery, there won't be any in ten years' or twenty years' time. I had to prove my point, so I knocked on all doors and stirred up scandal. That's the only reason why I've achieved some success."

At the Quiet-Flowing Don

Svyatoslav graduated from institute in 1952. He asked to be given a job at the river- or seaside, as swimming was part of his life. He was sent to the community of Vyoshenskaya where the famous author, Mikhail Sholokhov, made his home.

Vyoshenskaya was associated in his mind with *And Quiet Flows the Don,** one of the favourite books of his youth. There was the *maidan*** where the Cossacks used to meet. There were the recognisable market-place, the white *khata* houses drowned in greenery, the smell of willows. There was the high bank of the river with sun-scorched sand and a grey strip of pebbles.

Fyodorov was placed in charge of an eye-disease section for fifteen patients. He would make five or six operations a week. He worked half of his hours at the polyclinic and the other half at the in-patient ward.

In his first years as a surgeon, he challenged some of the established truths. He wondered why in cataract surgery only the lens nucleus was removed while the capsule was left in the eye. The latter would grow opaque in time, causing eyesight to deteriorate and resulting in secondary cataract which again necessitated surgery. "Can't the capsule be removed along with the lens? How? With the same loop," he contemplated.

Nobody was doing that at the time, but he risked it and achieved fine results in more than twenty patients.

He was invited to make a report in Rostov. Hearing the report, Professor Chistyakov, a well-known eye specialist, cleared his throat and said at length:

"Well, it's a good thing. It's something quite new and even revolutionary. But the risk is too great and I wouldn't recommend it to be practised on a mass scale."

Fyodorov was at a loss: if what he was doing was good, why not recommend it to others? Later he got accustomed to similar judgements: "Yes, this is something new. It's good. But there's some risk, so we can't... You can do it of course, but we advise others not to." Almost everything he has proposed has been judged similarly.

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* A novel by Mikhail Sholokhov.

** A square in some of the southern communities in the European USSR used as a meeting place or market-place.

For all his cares and duties, Fyodorov found his work in Vyoshenskaya a little dull. He had to do the same work day after day. And he hates monotony and boredom and always longs for change and new experiences.

He took up research work, not only because he was attracted to science. He wanted to study the eye as thoroughly as possible so as to understand its physiology and its ability to resist disease. He wanted (deep down he has always been ambitious) to perform new operations which only the greatest of physicians could do. He began working on a thesis which was to pave the way to a more interesting life.

Sheer Luck

In two years' time he defended his thesis and was awarded a candidate's degree*. He secured an appointment at a regional hospital. Shortly afterwards he won a vacancy contest and became section head at the Cheboksary Branch of the Institute of Eye Diseases**.

Together with other specialists, he made trips to nearby areas. He examined patients, gathered statistics and wrote articles. "Is this what research work is all about?" he thought. "What did I write my thesis for?" He had dreamed of challenging research but instead was engaged in routine work that any doctor could do. He wanted something more. He yearned for creative work. Meanwhile, he was exasperated by his own impotence in coping with certain conditions like the dimming of the lens. There were many patients like that. What if one tried to substitute an artificial lens for the damaged lens of the eye? Was it only a dream?

He came across an article in the journal *Vestnik Oftalmologii* which said that a plastic lens was just a fad and could do nothing but harm.

The author was a noted scientist but Fyodorov refused to take his word at face value. He has never been a blind believer in authority. "Why 'nothing but harm'? There are chemically inert

* The initial scientific degree in the USSR.

** Cheboksary is the capital of the Chuvash Autonomous Soviet Socialist Republic, the Volga region.

plastics which can do the eye no harm." He decided to act:

"I want to do some work on artificial lenses."

"Here at Cheboksary?" the deputy director asked sceptically. "That's impossible. Nobody is working on this in Moscow, and they have international celebrities and first-class equipment. No, the problem is too big for us here."

But there was no stopping Fyodorov. The more obstacles he faced, the more determined he became. He had to begin from scratch—without equipment, materials or supporters. But he was eager to find a problem he could devote his life to. He dreamed of defeating as much disease as possible. He dreamed of restoring eyesight to people whom medicine had given up as hopeless. He believed that he could help them.

He started to search for someone who could make a tiny lens. He looked long before meeting Semyon Milman, a production engineer at the Cheboksary Electrical Engineering Factory. The latter heard him out and said only this:

"We could try."

But the way he said those words, Fyodorov believed in him immediately. He remained euphoric for days and kept repeating: "We could try. We could try. We could try."

Two weeks passed and Milman brought a lens in a handkerchief. He unfolded it but there was no lens inside. Had he lost it? Fortunately, not. The lens was there—a tiny thing hidden in a fold. That was half the problem. Now it was necessary to attach microscopic clips to the lens with which it could be fixed in the eye. That was done too.

The lens was implanted in a rabbit's eye. Several days later the dressing was taken off and the healthy eye was tied in order to find out whether the rabbit could see through the artificial lens. It could. The rabbit hurried to a carrot and settled down to a meal. Fyodorov was overjoyed.

Milman made a few more lenses which Fyodorov implanted in animals. All of these grew normally and the lenses did not appear to cause them any discomfort.

Six months later Fyodorov had a 12-year-old patient by the name of Lena Petrova. From the age of two years she had had a cataract in one eye and could not see with it. Fyodorov decided to put in an artificial lens.

The operation was successful, and the girl regained normal vision. Things, however, might have taken a perfectly different course as the lens, both in its design and execution, was far from perfect. In recalling that operation, Professor Fyodorov has said:

"Certainly it was a miracle that Lena got her eyesight back and can see normally now. I still marvel at how lucky we were with her. It's just incredible that in those conditions the operation produced such results. I think that was sheer luck."

The Checked Waterfall

Frankly speaking, Fyodorov did not discover any Americas. He only repeated what other eye surgeons had done before him. The idea of implanting lens substitutes had first appeared long before his time. Over two centuries ago, the Polish doctor Gadini proposed fixing a rock-crystal lens in the eye after removing cataract (an opaque crystalline lens). But he was accused of being a charlatan and jailed. The idea was revived in our day.

Cataract is translated as a "waterfall". It was once believed that the opacity was a kind of film falling down like a waterfall between the crystalline lens and the iris.

In 1949 British surgeon Harold Ridley performed the first ever operation in which a cataract was replaced with a plastic lens. His first operations were successful and caused a sensation. But there were many sceptics as well. This was not surprising as the eye surgery of those days was based on a principle which declared that any alien body led to the destruction of the eye and must be removed. Accordingly, Ridley's technique appeared anti-physiological. Though he was accused of violating the fundamental laws of eye medicine, Ridley persevered with his work.

Then he had some followers. But after half a year of implantations, they all abandoned their work for too many post-operative complications.

Ridley's method was far from perfect. His lens was too large because he tried to imitate the size and shape of the crystalline lens of the eye. The introduction of such a large lens through the pupil did some damage to the eye.

Five years later a more sophisticated surgical technique and new models of artificial lenses were proposed in several countries at a time. The results were so good that foreign eye surgeons (Peter Choyce in Britain, Cornelius Binkhorst in the Netherlands and others) began to operate quite frequently and even on both eyes at one and the same time.

Now thousands of people have artificial lenses in their eyes.

But then, thirty years ago, it was widely believed that it was anti-physiological to fix a plastic lens in the eye since this was an alien body.

Nevertheless, after achieving his first success, Fyodorov implanted plastic lenses in two more patients. He succeeded again.

Any Job Will Do

At first, Fyodorov's operations were applauded in Cheboksary. But then the director of the institute received a letter from the Board of the All-Russia Society of Ophthalmologists which read in part:

"...There are data in the ophthalmological press warning against artificial lens implantations being practised on a wide scale. This operation involves surgical opening of the eyeball and the placement of an alien body inside. In the overwhelming majority of cases... good results can be obtained without opening the eyeball, with the help of contact lenses... The surgical technique of implanting an artificial lens is mechanistic... According to the data available, this operation often leads to corneal degeneration."

The letter was summed up in Cheboksary as a guide for action. No operations were to be performed on humans henceforth. Fyodorov asked the Health Ministry to be transferred to any institute in the country where he would be able to work on his topic.

"Any job in any town will do," he wrote in one of his letters. "Only I must have the opportunity of working on a topic which I believe in, which has captivated all of myself, and which I am sure will benefit the people."

The ministry replied quite soon but little was changed. The director assured Fyodorov that he would be given assistants but not now. Yes, there would be a vivarium and funds but not all right away as there were more pressing problems. Perhaps in a year's time. That could mean two years, or three, or even more.

Fyodorov learned that the eye disease chair at the Arkhangelsk* medical institute was vacant. He applied without any hesitation.

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* A city in the north of the European USSR.

So Cheboksary had let him down. Fyodorov revisited the town twenty-odd years later. He was welcomed by girls in Chuvash costumes. The health minister of the autonomous republic was present at the reception. The two-day visit was covered in local papers, and on radio and television. Professor Fyodorov performed several demonstration operations at the eye-disease hospital and met with his first patient.

In 1960 Lena Petrova was 12 years old. Now she is a teacher at a rural school. She can see almost 100 per cent with that eye of hers, "Fyodorov's" eye. But her son, named Svyatoslav, had a cataract too. Professor Fyodorov invited his namesake to his clinic and operated on him himself.

Professor Fyodorov was shown about the main eye-disease hospital of the republic. His host was the head doctor, the son of the director of the Cheboksary institute who had once...

Times are changing and we are changing too.

All this would happen many years later. In the meantime, the 33-year-old Fyodorov, full of energy, came to Arkhangelsk to start with a clean slate.

Starting Anew

He arrived in Arkhangelsk anticipating fresh success. He wanted to prove himself correct and persuade the sceptics. But he met with bad luck. His first two operations ended in failure. One of the patients had inflammation of the eye and the artificial lens had to be removed. The other patient began to see even worse after the implantation.

Fyodorov was forced to stop operating. Calming down, he began to analyse the cause of his failure, and he found it in the deficiencies of the lens. A new manufacturing technology was needed. Fyodorov made the acquaintance of Viktor Smirnov, a watchmaker, who made a tiny press to bend hoops with which the lens could be fixed in the eye. But to attach them to the lens, it was necessary to make microscopic drillholes. Now where could he find such tiny drills? He became acquainted with a man who undertook to do that job. For two months Boris Ventsenosov pegged away at miniature tools and did make micro-drills. But they proved good only for metal and got stuck in plastics.

Fyodorov went to Leningrad. At a watch factory he was

introduced to Nikolai Lebedev, a mechanic. Nikolai made a tiny drilling machine which could drill holes in lenses. Fyodorov began to look for someone who would undertake to make tiny moulds to manufacture lenses themselves. That job was done brilliantly by Alexander Karan.

At Cheboksary, Fyodorov had had to fight for his ideas all alone. There were no people who believed in his ideas as much as he did. In Arkhangelsk he had supporters, notably among his pupils.

Even before he arrived in Arkhangelsk, people began talking of "that same Fyodorov" coming. Medical students would take their friends along to his lectures.

Fyodorov organised a student research group. At first, quite a lot of students turned up. But gradually most of them dropped out. The leader seemed to be too demanding.

The first day he met his pupils, Fyodorov told them: "We've got too much work to do. So you won't be writing abstracts as they do in other groups, though it might be quite good for you. It's much more important that we try to restore eyesight to patients."

The Relay of Good

At Arkhangelsk, Fyodorov obtained precision instruments. He took charge of a chemical laboratory and a small experimental production unit. Certainly, many things were still lacking and lenses continued to be manufactured in far from ideal conditions. And yet, this was some success.

It was too early, however, to celebrate victory. Inside the medical community, Fyodorov found himself surrounded with a barrier of caution. It was not so easy for patients to break through. More often than not, they came to Arkhangelsk without letters of reference. The local doctors tried to dissuade them from undergoing surgery.

Then one of the leading newspapers carried an article which said in part:

"...Attempts to fix artificial lenses in the eye are being advertised as a kind of sensation, though such lenses have failed to prove their usefulness. It has turned out that there is more risk than benefit resulting from this surgery."

One of the main arguments quoted in the article was that a peice of plastic was an alien body which could only inflame eye tissues. This was a dogma which could not yet be discarded.

Meanwhile, patients were returning from Arkhangelsk with restored eyesight.

Alexander Bocharov, an engine driver who had had his eyesight restored almost to normal in Arkhangelsk, wrote to a newspaper: "I don't know what Fyodorov has done for science, but he has done for people what no institute in the country can do." This was the best argument in the dispute, but some would not listen to it.

Patients, however, believed in Fyodorov. They even believed in legends about him. For several years he had worked fourteen to fifteen hours a day, almost without days-off. In December 1965 a group of patients wrote to the newspaper *Izvestia*:

"We are no longer surprised to see Assistant Professor Fyodorov and his aides at the clinic all day long, from eight o'clock in the morning till eleven in the evening, even on Saturdays, and on Sunday mornings they again examine the patients and put on fresh dressing, and in the evening they themselves make artificial lenses for each of the patients. All told, these people led by Assistant Professor Fyodorov are working without sparing themselves."

But the situation at the Arkhangelsk clinic became quite complicated. There were too many patients and they did not want to be on the waiting list for years. They wrote that patients from all over the Soviet Union had been arriving in great numbers and, willing as they were, Fyodorov and his colleagues could not cope with them all.

There were many letters like this, and they played their role. In 1965, an artificial lens research laboratory was set up at the eye disease chair of the Arkhangelsk Medical Institute. A short time later Deputy Health Minister A. Sergeyev visited Arkhangelsk. After inquiring into the situation, he told Fyodorov:

"You need to be transferred to Moscow and given a modern clinic with the latest equipment, precision optical instruments and electronics. Otherwise, your method might go to seed and you won't do much good."

Fyodorov left Arkhangelsk, just as he had left Cheboksary, with a scandal but for a different reason. Previously they had wanted to get rid of him, now they did not want to let him go. Particularly since two other doctors, Albina Ivashina and Valeri Zakharov, pupils of Fyodorov's, went with him to Moscow.

Not that Fyodorov was given a red-carpet welcome in Moscow. In the ophthalmological community he was regarded as a trouble-maker. There were hints that he would have a lot of problems because of his character.

He wrote the following to a friend of his:

"In Moscow, the attitude to me is a cold one. I'm lambasted from time to time. But that's a good thing: it lets more adrenalin into the blood. I'm in a fighting mood. I want to bite back."

During his first five years in Moscow, the Fyodorov "tree" began to grow wide. At first there were small shoots, but as soon as they broke away from the trunk, they turned into hefty branches capable of bearing fruit. One daring idea generated dozens of others. This was a kind of intellectual chain reaction which could not be checked once it got off the ground.

There was the keratoprosthetics, that is the development of a prosthetic device to be implanted in the cornea in case of burn leucomas.

There was a project to develop a vitreotome, i.e., an instrument for the surgical replacement of an opaque vitreous body of the eye. The technique, pioneered in the Soviet Union, was viewed by many specialists as an outrage against medicine. The accepted opinion was that the removal even of a small part of the vitreous body was destructive for the eye.

Efforts were made to create a new theory for glaucoma and thereby develop a new surgical technique to combat this dangerous disease. The first steps were undertaken in surgical correction of myopia and astigmatism.

Those were just some of the new fields in eye microsurgery which became central to the work of the Institute of Eye Microsurgery led by Fyodorov.

Today Professor Fyodorov has many dozens of pupils. He has helped open research centres concerned with microsurgery in Rostov-on-Don, Saratov, Kuibyshev, Leningrad, Gorki, Orenburg, Omsk, Krasnoyarsk, Kemerovo... His new methods of eye microsurgery have been introduced in 30 towns and cities in the Soviet Union.

In April 1986, the government moved to establish a Research and Technological Complex of Eye Microsurgery on the basis of the Institute of Eye Microsurgery headed by Professor Fyodorov. The complex has thirteen branches across the country. Professor Fyodorov was appointed general director.

All new instruments, lenses and surgical techniques developed in the centre will immediately be introduced in the branches. The

complex will bring advanced technology to doctors on the periphery as quickly as possible. As a result, high quality treatments provided in the centre can become available all over the country.

A Monument to His Victory

As soon as Fyodorov moved to Moscow from Arkhangelsk with his laboratory, the All-Russia Society of the Blind* asked him to examine its members and help those who could be helped. Eleven thousand patients were examined and many had their eyesight restored.

But in Moscow, like in Arkhangelsk, he could not at first treat as many patients as he would have liked.

Professor Fyodorov believes that medicine is pushed ahead by patients. And he has sought to treat as many patients as possible. Hence his effective new methods. Those with good eyesight care little about cataract, astigmatism, opacity of the cornea, myopia, retinal detachment, tunnel vision, or blindness. But Professor Fyodorov meets such patients every day. His heart is full of sympathy for them. This steady flow of patients makes him tick just like a river the water-mill.

"I couldn't live otherwise now, or in a more relaxed way," Professor Fyodorov explains. "I like the thrill of having to overcome obstacles all the time. It makes me feel as if I were flying. And it also makes me jump higher and higher each time. We're now making one hundred successful operations on the conveyer belt, but I want more. I want to help more patients and make them feel happy. Every morning I go to the clinic anticipating further victory over diseases that were considered hopeless just recently. And it all began with the artificial lens. Nobody was doing that, so I thought I'd do it."

"You were ambitious, weren't you?"

"Quite. There was no surgical treatment for myopia. So I thought I'd try. Now it's the same with far-sightedness. I want to prove, if only to myself, that I can do something here that nobody

* A public organisation whose members are blind or suffer from severe vision defects. It was established in 1925 to improve their job and education opportunities and help them to become useful members of society.

has done before. In constantly surmounting obstacles I see the joy of life. Still, the first impetus that makes me work so hard is the patients themselves. When somebody comes to me with an incurable disease, I feel ill at ease. Why is it that nobody has devised some treatment for it? If there's this disease, there must be a way to cope with it. So I try to forget what the medical books tell me—that this disease is beyond our power. Why? It must be stopped. This sets me thinking: ultrasound, laser, microsurgery. I know everything about the "enemy" as we have fine diagnostic equipment.

"I've always wanted to be a soldier. Civilian life seemed boring to me. I grew up among the military. Sabres and guns were my toys when I was a child. When I became a doctor, I was ashamed of my career at first. But then I realised that I was more of an armyman than my friends in actual service. Every day we defend people not against bombs or bullets but against germs, inflammation or decay of blood vessels. Medicine is an army in its own right. Some ten million operations are performed in this country every year. This means 27,000 daily battles for human life and happiness. Really, it's like a battlefront."

Doctors from all over the world are coming to the Fyodorov Institute to master new methods of treatment, journalists to write about these methods, and Fyodorov's friends and acquaintances just to take a look around. No matter how busy he is, the director always finds the time to show visitors about personally.

First on the rounds, as one might expect, is his own department.

"I'll show you a hunter. Yesterday Samat Akhrarov, a young surgeon from Uzbekistan*, fixed him a new kind of lens."

We entered the ward. There were four beds but no patients. Where had they gone? Where was the hunter who had undergone sophisticated surgery the day before? Not so long ago such patients would stay in bed for a whole week. The man was in the corridor, stretching his legs with other patients. On seeing Professor Fyodorov, he hurried to him and gave him a hearty handshake.

"You're too strong for me. You nearly crushed my hand," Fyodorov laughed. "How are your eyes?"

"I just had a check. One hundred and forty per cent."

"How was it before you had your cataract?"

"The same."

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* One of the 15 Union Republics making up the USSR.

In time, such patients will not need beds at all.

"I want to have one bed out of the four removed and have a sofa, a small table for newspapers and a colour TV placed instead. The new technology makes it possible to deal with cataracts and implant a lens on an out-patient basis. After the surgery, a person will relax in an easy-chair for three or four hours, have some tea and then go home.

We entered a spacious hall with arm-chairs, flowers, rugs and pictures on the walls. Those were not reproductions but originals—modern painting bought recently from the USSR Fine Arts Academy.

In a staff room Professor Fyodorov introduced us to a dark-haired young man:

"Meet Vasiko Kokhreidze from Tbilisi. He's taking a postgraduate course here and when he graduates we'll 'land' him back in Georgia*. We'll need three other bright surgeons like him and our ideas will win over that republic. The same is true of other places. These 'landing parties' are armed not only with new knowledge but a new mentality. The main thing they must realise is that there is nothing that cannot be done but there are lazy and indifferent people. There's no periphery in science."

Another young doctor, Vladimir Tingayev, entered the room. Two years I had seen him at Professor Fyodorov's side. He had been his assistant and was now in charge of a large new polyclinic housed in a seven-storey building next to the main block. The institute likes to entrust responsible jobs to young specialists.

There was a patient waiting for Professor Fyodorov in the operating theatre. He was a young man, a pilot from Bulgaria. He suffered from progressive myopia and the doctors had forbidden him to fly. Did he have to give up his career after putting his heart and soul into learning it? He decided that he would not give it up without a fight. He had long looked for a doctor who could restore his eyesight to normal, and here he was in Moscow for a few days to consult Professor Fyodorov.

"What's there to be consulted about? It's all clear as daylight," Professor Fyodorov told him when they met for the first time. "You go to clinic today and in a week's time you'll see as you did before."

Fyodorov walked up to the operating table. He spoke a few encouraging words to the patient and examined his medical history which indicated the length and depth of cuts to be made

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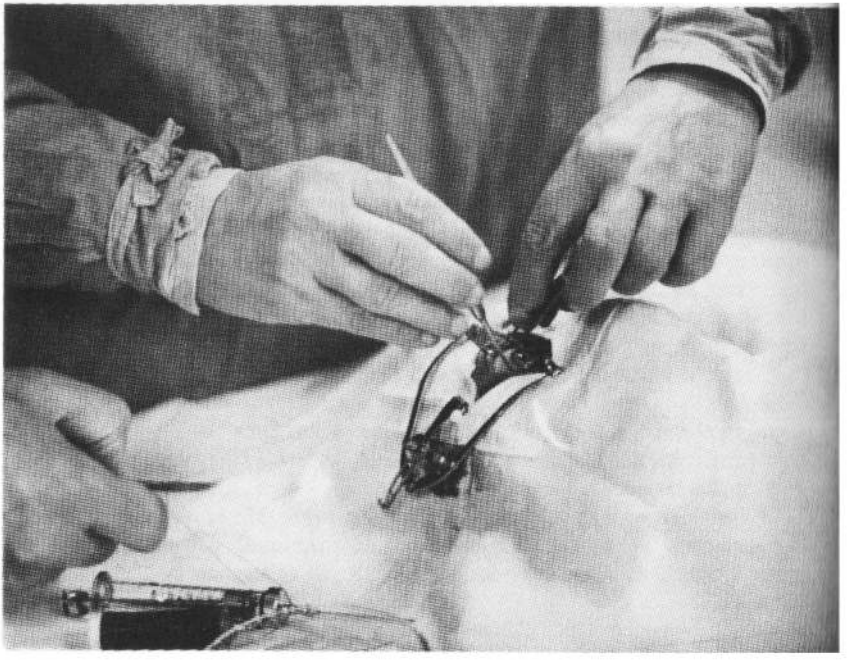
* One of the 15 Union Republics.

Professor Fyodorov at work.



on the cornea of his eyes. The cuts had been calculated to an accuracy of several microns.*

I timed it. The operation lasted a few minutes, including the encouraging words and good wishes to the patient.

Such operations are usually made on the conveyer belt, but this was a Friday, a day-off for the conveyer belt. The sophisticated machinery needed maintenance.

In the reception room, Professor Fyodorov had an appointment with a West German television team. Floodlights flashed on and the camera wires could be seen lying on the floor. "Herr Professor, please sit a little to the left. That box will have to go. Sehr gut. Come on."

"What is the secret of your success?"

"You have to believe in success. Without that belief I would have achieved nothing."

"What qualities in people do you like most?"

"Creativity, a longing for action, and honesty."

"What do you dislike in people?"

"Flattery and demagogy."

Germans are known for their practicism, they are interested in real things:

"Herr Professor, how much have you earned from your numerous discoveries? You must be a millionaire."

"I'm not," he smiled. "But some of my American colleagues who've borrowed our techniques have indeed become millionaires. It seems to me, though, that they don't know how to spend their money. They are saving it. So I tell them: 'Boys, shall I help you spend your money? Let's buy new medical equipment, build new clinics and feel all the happier for it because every day we'll see even more smiling and happy faces of patients who can see with their eyes again.' That's why I like my work. The day after the operation I can see many grateful smiles. That's much more important for me than millions in money."

The reporter liked those words so much that he began to clap his hands. After a brief pause during which he noisily discussed the professor's words with his colleagues, the reporter spoke to the poet Andrei Voznesensky who had come to visit his friend at the institute that day:

"We didn't expect to see such an active, enterprising person here, within your social system. Don't you think that Professor Fyodorov is a Western type and a stranger to your society?"

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* One micron (micrometre) equals 10^{-6} metres.

"Not at all. I think that my friend, Svyatoslav Fyodorov, is typically Russian and typically Soviet. I know quite a lot of enthusiasts like him in this country. They are doctors, actors, scientists, teachers, engineers and industrial managers. At this time when we are rebuilding our great economy to put it on a more businesslike basis, we need such people very much. We need to care about them, though they may be difficult to get along with. As for my friend, I must say that he's a man with a large heart and a clear mind, and he knows what he wants. The main goal of his life is to combat blindness in all its manifestations. Today you have seen the unique institute he has founded. This is a monument to his victory. He's a winner indeed, and this is very important because his victory should inspire others to combat disease as he does. He not only restores eyesight to people, but he remoulds their thinking. To me, he is innovative primarily in this respect. Svyatoslav Fyodorov is also an international personality. I'm sure that his work and energies are changing life not only in this country but outside it."

Many foreign visitors come to the institute. Hardly a week passes without foreign specialists visiting the clinic. There are technique-sharing courses open at the clinic. More than 400 eye surgeons from 60 countries have already attended them.

Enrollment is quite simple. A foreign specialist needs to send a telex message to Moscow at 411-856 "Oko" or call the telephone number 484-81-20 and answer two or three questions.

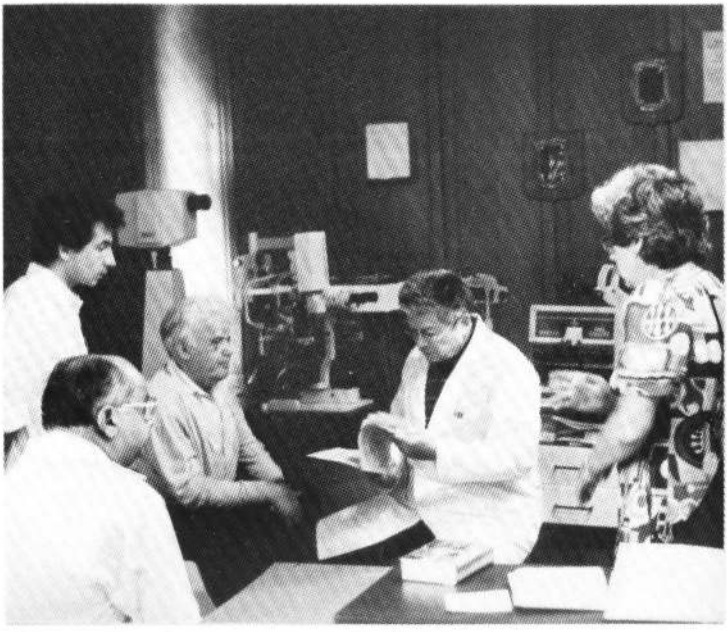
The programme of studies is decided according to the given specialist's qualifications. For an experienced surgeon five days will be enough to go through theoretical and practical classes. What he wants to focus on is subject to his own wishes.

As of 1987 the topics of the courses have been greatly expanded. In addition to lens implantation and myopia and astigmatism surgery, foreign specialists are trained in surgical treatment to reduce far-sightedness, in keratoprosthetics, and in surgery on the vitreous body and eye tumours. The curriculum may include accurate diagnostics necessary to determine all the parametres of a forthcoming operation.

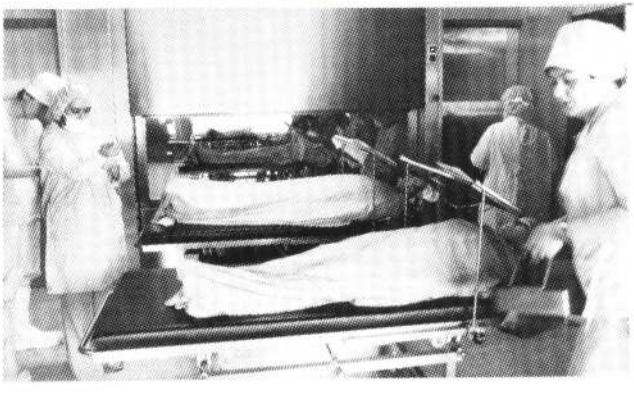
The cost of a five-day training course at the institute for a foreign specialist does not exceed $1,400. A two-week course, naturally, will cost more. Groups receive a 30-per cent rebate. The institute can receive at a time three groups of seven each.

To have surgery at Professor Fyodorov's clinic, a foreign patient needs to contact the Intourist office in his country (or a company representing Intourist interests) and buy a treatment

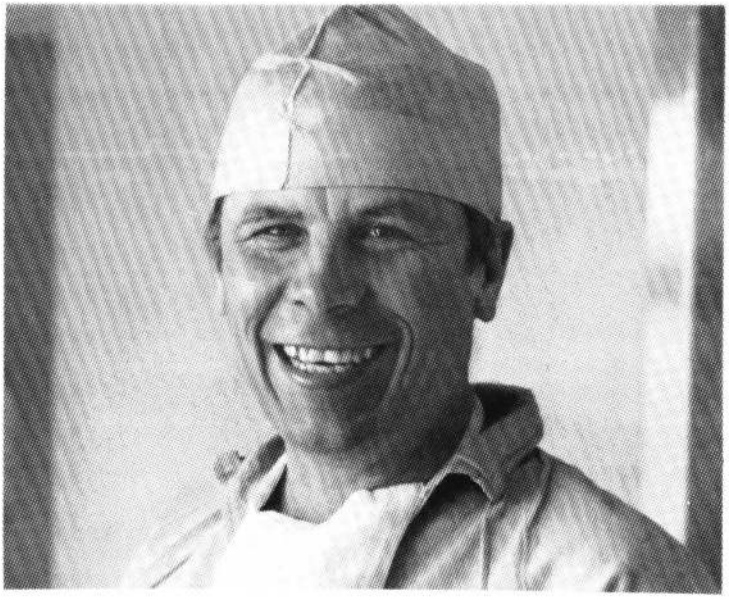
ofessor Svyatoslav Fyodorov

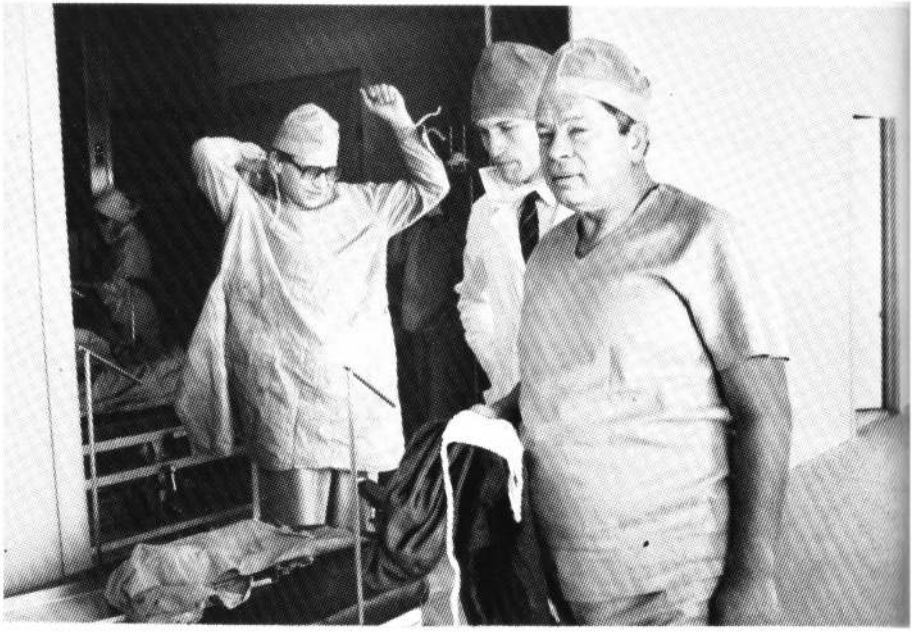


Patients from various parts of the Soviet Union and abroad come to the Institute of Eye Microsurgery, known popularly as Fyodorov's clinic. They are diagnosed with the latest equipment.

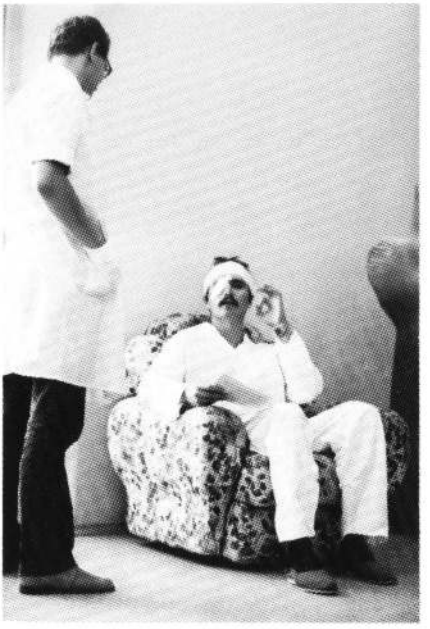


An automated operating theatre. The tables with patients slide noiselessly from one surgeon to another, from one stage of the operation to another.
This is radial keratotomy, correction of short-sightedness. During the operation, surface cuts are made on the cornea of the eye, causing it to change its elastic properties.

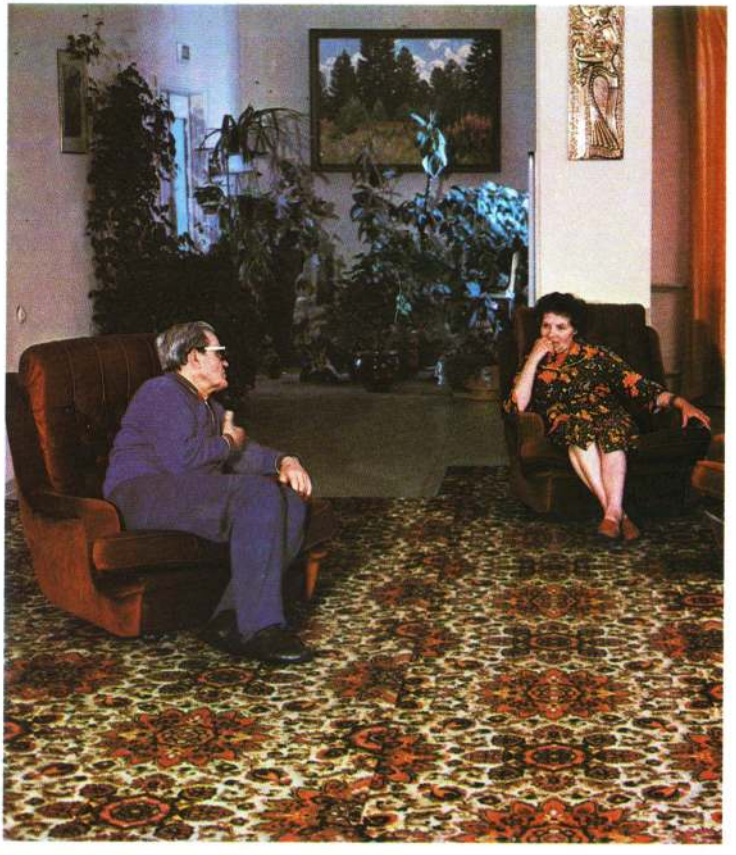


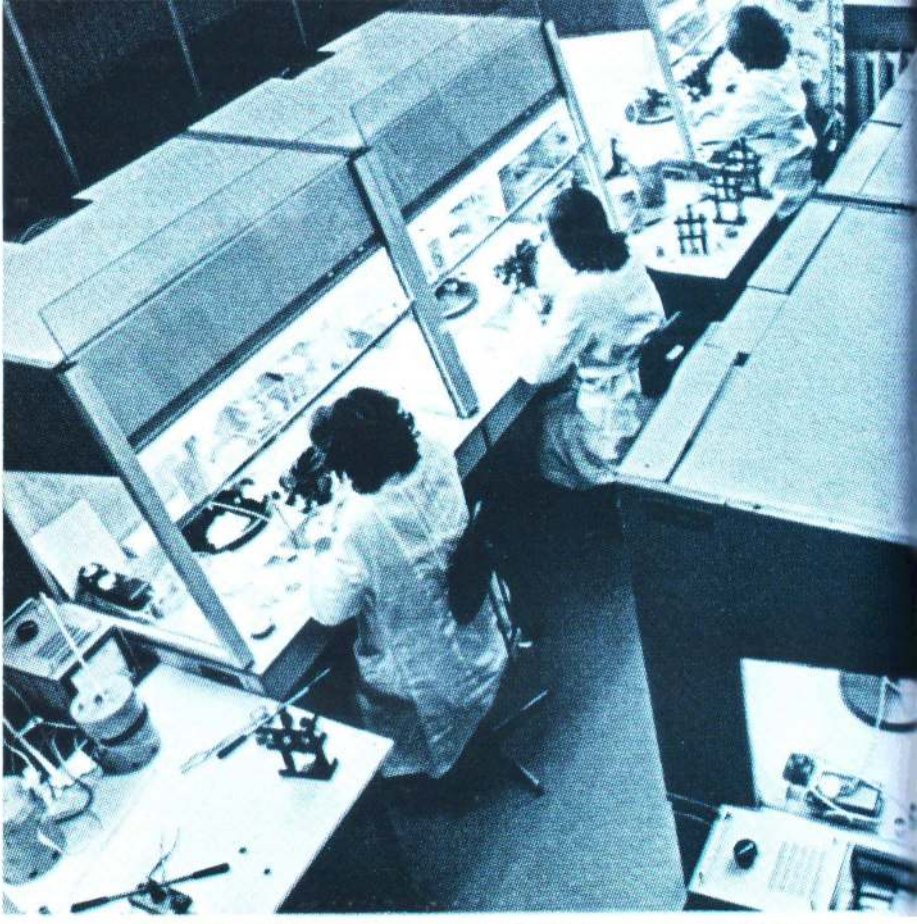


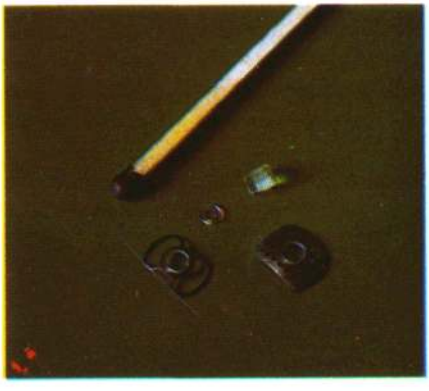
The day's operations over, he can relax a little, talk to his colleagues, and examine post-operative patients.

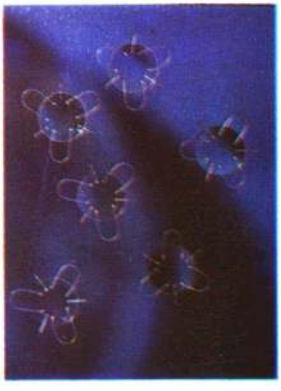


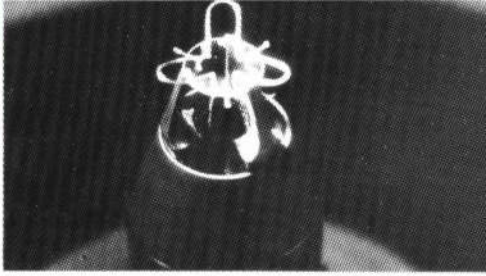
The new building of the Institute of Eye Microsurgery is equipped with the latest medical instruments and computers. The patients feel at ease in light rooms and spacious lounges where they can have a chat, leaf through magazines, or watch television.

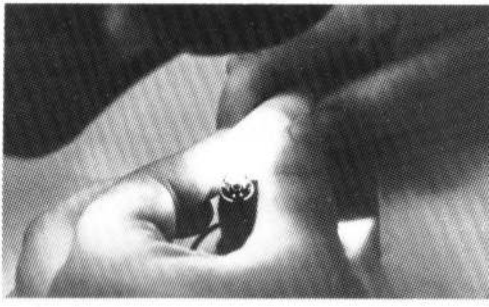


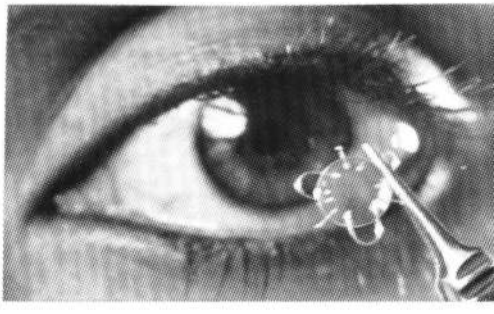






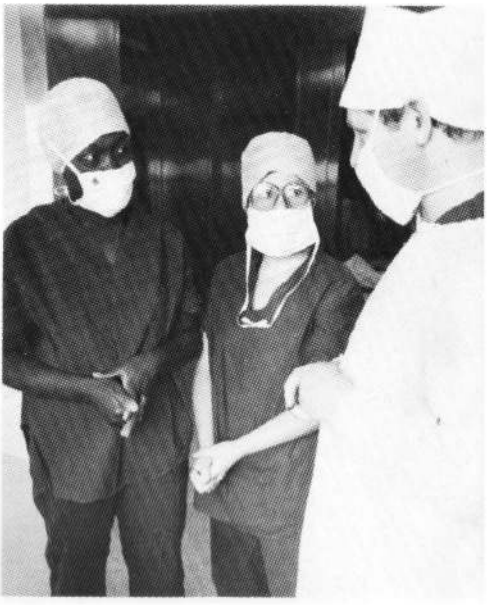






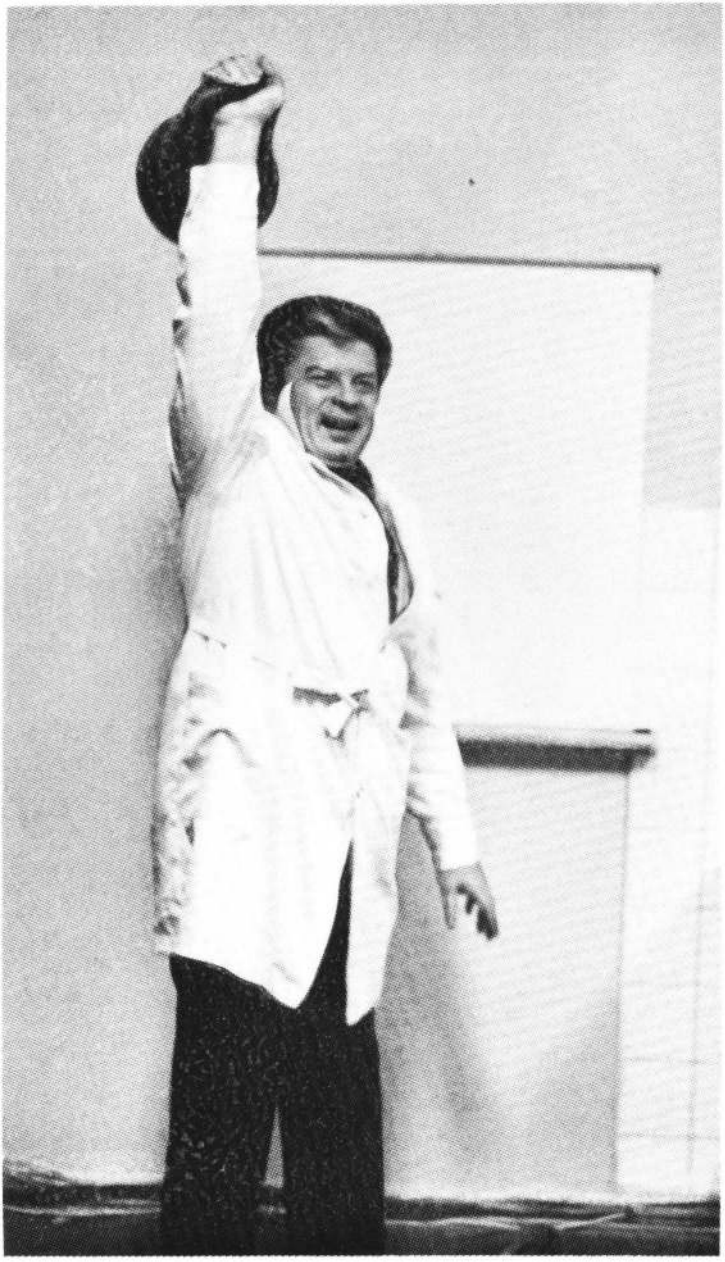
An experimental factory at the Institute of Eye Microsurgery produces artificial lenses, "iris-clips lenses" of the Fyodorov-Zakharov design, and various instruments used for operations on the eye.

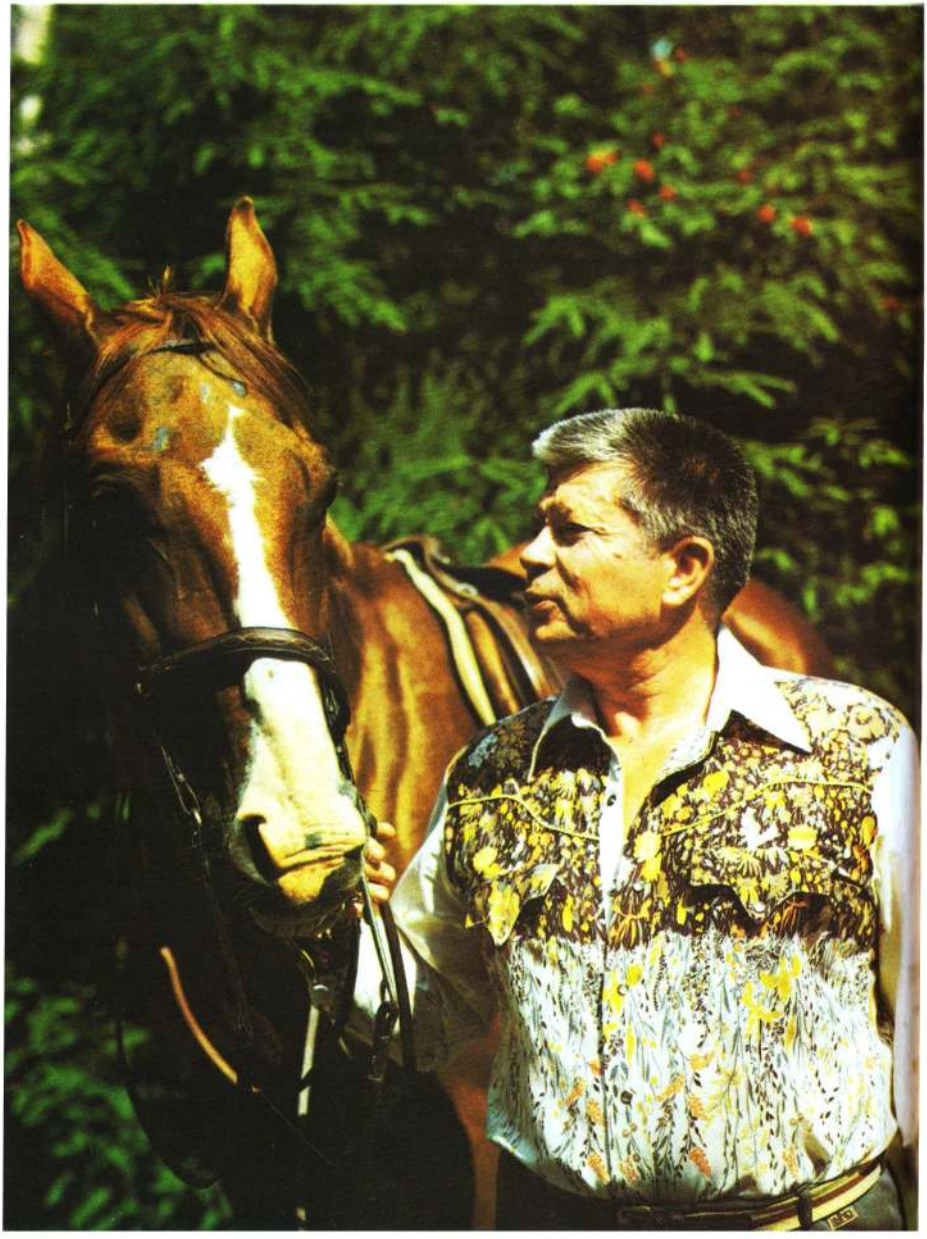
Professor Fyodorov with the British ophthalmologist Harold Ridley who carried out the first implantations of artificial lenses in the late 1940s and early 1950s.



Specialists from many countries are interested in the work of Professor Svyatoslav Fyodorov and his staff. They come to Moscow to learn new techniques of eye surgery.

He searches, invents, persuades, feels glad or bitter. And he wins.





scheme at the Institute of Eye Microsurgery for a term from eight to fourteen days.

When a group of foreign doctors before leaving for home meets Professor Fyodorov one last time to discuss the results of the visit in an informal atmosphere, this resembles a parting of friends. This friendliness is kindled by the open-hearted Professor Fyodorov with his fine sense of humour and an ability to come to terms with other people very quickly. Often I have heard his foreign colleagues say that they should cooperate because, among other things, their joint work contributes to peace and progress on our planet. When he bid his farewell, Hal Waldman, a surgeon, remarked that it was a wonderful thing that, despite everything, the Americans and the Russians continued to be friends, and noted how much there is in common between the two nations and that therefore they should always be friends.

A Japanese patient at Professor Fyodorov's clinic.

For all his practical work, Professor Fyodorov is basically a dreamer. One can only wonder how this quality goes along with his ability to stand firmly on the ground.

When I read his doctoral dissertation, I found so much fantasy in it, or rather what might have appeared fantasy back in 1967. I think that if he had not become a surgeon, he should be a poet now. I also feel that it's a good thing that he was ordained such a romantic career.

Professor Fyodorov has had many dreams indeed. He dreamed of his own clinic. He wanted it to be T-shaped, like an aircraft. After all, he had dreamed of flying. So let his institute be an extension of his former dream on earth. This is now a reality.

He dreamed about a mobile operating unit fitted out with the latest medical equipment. And he got it. But "got" is not quite the word. He had to work hard to bring that project to fulfilment. He made a sketch of the bus himself. Then he held talks with a Finnish company which undertook to make it.

Professor Fyodorov and his assistants now travel in it around the country to share their expertise.

Professor Fyodorov explains: "When I operate in this bus somewhere in the province, when I know that my work is being followed on TV by hundreds of local surgeons who may be watching the operation for the first time and perhaps will learn to do it themselves, when I hear the gentle music inside the bus and have a miniature microphone at hand to talk to the audience of watching surgeons, I am hard put to believe that all this is not happening in Moscow. And then I feel what is hailed as happiness."

Each year, institute specialists make several bus trips around the country. With their help, lens implantations are now performed in many towns and cities.

You should see how these trips change young specialists. When a commencing surgeon operates and his work is watched by the eye specialists of, say, the entire Rostov region, he must feel like a teacher. A great deal of responsibility falls on him. After several such trips a young man or woman becomes a first-class surgeon.

Professor Fyodorov now dreams about an airborne surgical theatre. In a matter of hours an aircraft like this could take him

to a far-away city where he could teach local doctors new techniques and leave them the essential equipment for some time.

Some people say: "That's a pipedream." Well, not so long ago the same was said about the bus project. Similar opinions had been ventured before that about artificial lens implantations.

Professor Fyodorov has one more idea in his head: "I'm dreaming of setting up such a clinic as would be dominated by a spirit of creativity and in which all specialists without exception would do their work freely like scientists or inventors, without distinction due to rank or age."

He has already done much to this end.

I once watched him interview a young doctor seeking employment at the institute. As he answered his questions, the young man was anxious to stand up and speak standing. Each time Fyodorov asked him to sit down and after repeating "Please, sit down" for several times, he uttered:

"Young man, you shouldn't worship rank here. Here we worship intellect. Try to get the professors to take off their hats for you. Here we've got every opportunity for this. Do your best, and we'll help you along."

Those were not empty words. The atmosphere at the institute is indeed conducive to creative endeavour and innovation. Good work is respected here. What worries Professor Fyodorov is not when a beginner has started independent research without asking an opinion but rather when a young specialist is not after him with some new idea.

He elaborates: "Everyone should be given the possibility of implementing his idea. That's the only way of creating an atmosphere in which the people will believe in their abilities and create something worthwhile. Their work will make them happy. I dream about a time when every specialist at this institute will be happy with his work.

Professor Fyodorov has another dream—to rid humanity of spectacles.

Every year the world spends several thousand million dollars on spectacles. The Soviet Union alone produces 100 million roubles' worth of spectacles a year. Professor Fyodorov hopes that in the near future, after his surgical techniques undergo some further refinement, glasses will become a museum relic.

But it seems that Professor Fyodorov's main dream is to restore eyesight to the blind.

We, who can see with our eyes, never think what a wonderful gift we possess. We take our sight for granted. Now try to close

Acting out his dream of a world without spectacles.

your eyes for a couple of minutes and imagine this is going to last forever. A dreadful experience, is it not?

There are a great many people with their eyes "closed" forever. How many exactly? In 1928, the number of blind people in the world was estimated at six million, with another fifteen million disabled as a result of serious eye defects. In the intervening half-century, the number has doubled.

I once talked to a former patient of Professor Fyodorov's. He had been blind almost from birth, and regained his sight right on the operating table: "When I saw the light, it slashed my eyes like a knife. It was sharper than the scalpel."

But now that he could see, he lost all idea about the objects he had known so well when he was blind. He could recognise people only by touching their faces with his hands.

The streets he had walked as a blind man were strange to him and he got lost. He could pick up his way only by closing his eyes for a moment.

"I can see. I can see it all," he kept repeating to himself. "Can you see it all, too?"

There are now about 300 lucky persons like him for whom the institute can take credit.

The blind are yearning to have their eyesight back, and Professor Fyodorov believes that his clinic will live up to their expectations. Daring research to combat blindness is now under way and the doctors hope that many grave diseases will yield to treatment some day.

What We Need Are Conductors

"Slava*, wait a little. Let's get closer in. Don't jump yet, please."

Irene, Fyodorov's wife, thought that the boat was still too far from the shore, and so did I.

But he thought otherwise. The boat was speeding along, jumping from one wave to another. It was hot. A hot wind was blowing in the face, bringing no relief. I wanted to leap into the water. But the shore was a mile and a half away and I felt a little scared. But Fyodorov did not. He had already placed one leg overboard and was shouting to the man at the wheel to go slow. The speed dropped and with a gleeful "Off we go, boys" he went headlong into the water. A few seconds later his head popped up but those few seconds seemed like an hour to his wife.

"At long last," she sighed with relief. "I'm always so worried about him."

"With such a guardian angel as you, he'll come to no mischief," said I. "Is it difficult to be Fyodorov's wife?"

"Difficult?" Irene smiled. "Of course, it's difficult when there are new people coming to our place every day. He'll call me at eight in the evening to say he's coming home. And he'll come with two, three or four others. 'Look whom I've brought along,' he shouts from the doorway as though they are his best friends, but I am seeing them for the first time in my life. It's either his former patients, or doctors from other cities, or some acquaintances of

* Diminutive from Svyatoslav.

Svyatoslav and Irene Fyodorov.

his: horsemen, electronics experts, hunters, armymen. They dropped in to see him at the institute and he brings them all home. He has the energy to discuss some mundane problems with them till midnight. But, you know, I always dreamed about a husband like him. A man to be proud of, a dependable man," added Irene.

They had met when they had two daughters each, both feeling some sort of disillusionment. Now each sees the other as a reward for the hard times.

The boat made a turn round the cove. I was thinking to myself just how lucky I was to be holidaying together with them. Almost every day we met on the beach or at the hotel and Professor Fyodorov leisurely told me episodes from his life. I would never have had such a unique opportunity in Moscow.

His head with crew-cut grey hair had long disappeared from sight. Had he made it to the shore? Hardly. He must be half-way through. I had always thought myself to be a good swimmer but, though much younger than Fyodorov, it was difficult to compete with him. The day before we had swum together. I lasted for half an hour and then turned back but he kept going to the horizon. There seemed to be no stopping him. He is sailing through life's waters similarly, like a battleship.

The boat pulled up to the berth when Fyodorov was coming ashore. He sat on the pebbles and waved his hand to us with a happy smile. I thought: "If his problems come to an end tomorrow, he'll simply die from boredom. No, he'll invent new problems for himself, just like a bulldozer piles up earth before itself."

"Do you know the formula of happiness?" he asked me as I sat down beside him.

"What is it?"

"It's like a fraction, with one in the numerator and envy in the denominator. So, it's a one divided by envy. The sea is good for thinking. You know, what we need most now?"

"Who are we?"

"Russia, the country. What we need is conductors."

"You mean symphony orchestra conductors?"

"Yes, I do. Every group or team is like a symphony orchestra. With the present level of technology being as it is, we need talented organisers with encyclopaedic knowledge who could understand people's minds and do many expert things with their own hands, as Leonardo da Vinci could. In addition, they should know the great many things that go to make a good organiser nowadays. One must be able to encourage people with his own skills, unite them in groups or, conversely, split them and then begin making a melody. We travel in our operating mobile unit around the country to convince surgeons that if modern technology is changed a little, the quality of surgery can be upgraded to a new level. Another aim that I set for these trips is to find talented organisers capable of pushing science on. You can install the latest equipment at a clinic, but without a good conductor nothing good will come of it. I always tell my colleagues who go on such trips without me: 'Find me a young man who'd be dying to work hard and who'd be ready to stay at the clinic till late at night and never get tired. That man can cope with any problems. He can become a conductor.' "

"Have you found many people like that?"

"Unfortunately, no. I can name five, not more. Young people have become used to walking along well-trodden paths. They want to have everything on a plate. Just say 'open sesame' and there you are. Infantile young people worry me a great deal. But we are to blame ourselves. We create hot-house conditions for our young. We care too much for them. That's why they are trying to dodge problems. They are not trying to become conductors."

"But nobody taught you to be a conductor either."

"My own life did that for me. If I hadn't many problems to overcome from childhood, I might have grown up like a hothouse flower that would wither at the first touch of cold."

Time to Reap

"Lunch time," Irene called out to us.

And what a fine couple they are! He can talk about his work and problems all day long. Another woman would have protested long ago but Irene seems to like it. True, Fyodorov can mesmerize his audience of one listener, ten or even a hundred.

When you read his words on paper you don't feel this hypnotic effect, but when you talk to him in person, it is unlikely that his ideas will leave you indifferent.

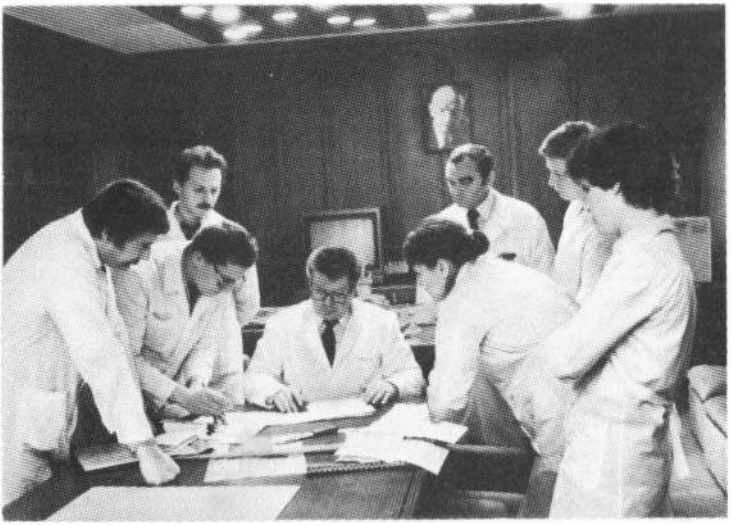
My holiday in its third week, I was inspired with his passionate discourses and kept thinking of his work, clinic and cares.

Many tears have been shed at his clinic. Those were tears of joy. I saw a man who had regained his eyesight after being blind for a quarter-century. He wept with joy when he saw his son, already a grown-up man, for the first time. Without any exaggeration, the clinic can be called a factory of happiness. No matter how much it may cost the state, the state nonetheless will be spending money on it.

It would seem that Professor Fyodorov should be happy with things the way they are now. What can be more gratifying indeed than to help people recover the thrill of living. But this does not appear enough to him. He is convinced that any kind of activity, however high-minded, must be profitable, and the more profit it yields, the better. Now what profit can possibly be derived from eye care?

The institute has its own motto which reads: "Three harvests a year." Without increasing the number of beds, the clinic provides treatments to three times the fixed number of patients. How is that done?

When the institute (called a problem laboratory at the time) began to introduce the latest technology including lasers, ultrasound, and precision instruments, they realised that the new technology involved tremendous responsibility. What was to be done to enhance the responsibility of the doctors? The only way



Plans for future operations.

Professor Fyodorov's team in the surgery room.

of doing that was to have one doctor responsible for a patient throughout the period of treatment. Professor Fyodorov split the clinic staff into teams each consisting of three or four specialists who were placed in charge of 15 to 20 patients and made fully responsible for the equipment. At the end of each month, the work of all teams was compared and the results were hung on the board in the corridor. All teams were equal, including the one led by Professor Fyodorov himself.

Just one year after the new method was introduced, the number of operations had dramatically increased and the average length of hospitalisation had greatly reduced. Nationwide, an average of 12 patients are treated per bed annually, and at Fyodorov's clinic, as many as 36. This was achieved without any additional investments.

Now there are no weak surgeons at the clinic, as positive ambition urges one to work hard. But, more important, the number of complications had dropped dramatically. This would seem a paradox: there are more operations but fewer complications. Professor Fyodorov explains:

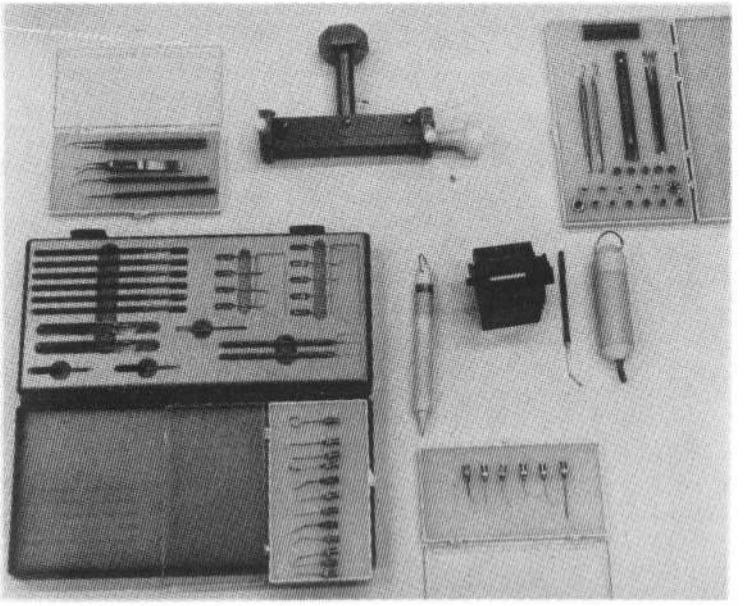
"It's nothing to wonder about. When you operate a lot, you're bound to become a good surgeon. One year or two after graduating from college, our staff are already considered highly skilled specialists. They can implant lenses and perform myopia surgery."

At first there were sceptics who resented such involved surgery being entrusted to surgeons without much experience. Certainly, there were problems and even mistakes which had to be corrected by more experienced colleagues. But that system stopped people from remaining middling, unimaginative specialists for long.

Then came the time to reap.

All of a sudden (but was it really so sudden) surgeons fresh out of college began to suggest quite mature ideas. Professor Fyodorov is convinced that the earlier a young person shoulders responsibility, the earlier he is moulded both as a specialist and a personality, and the more hope there is that he will grow into a high-class doctor and a broad-minded scientist.

Thirty years ago when Fyodorov just began his experiments in implanting artificial lenses in rabbits, many officials responsible for funding his research tended to underestimate it. Accordingly, the funds they provided were inadequate, and Fyodorov had to prove that he needed more money as his research was highly promising. He argued that one rouble invested then would yield a profit of five or six roubles in the future because his technique



Ophthalmological instruments.

Experimental factory products: artificial lenses ready to be posted.

would help people return to active lives. They would begin to work for the good of society instead of depending on it for their livelihood.

He has been proved correct. There are 320 beds at his clinic. Each year 6,000 patients undergo surgery in excess of plan. They stay in the clinic one-third the usual time. This means that the clinic saves about six million roubles a year. Soon the number of beds at the clinic is almost to double. Accordingly, the clinic will save the state twice as much money (medical services in the USSR are provided free —*Ed.*).

Professor Fyodorov has on occasion to argue with economists who reproach him for demanding too much of the government for his "fantasies". Each time he has to prove that nothing can be more advantageous for the nation than to help a former patient back to active life. Furthermore, the institute earns some two million dollars a year by selling licenses for new instruments and equipment. In 1985 an American firm purchased licenses from the Fyodorov institute totalling three and a half million dollars. In addition, hundreds of foreigners pay for having surgery at the institute or taking courses there. The experimental factory at the institute will soon move to a new home. It will expand production and will begin manufacturing new instruments, part of which will be sold to foreign companies.

After the eye microsurgery complex is established, the entire system of funding will operate according to the industrial model. The complex will not only repay investment but generate profits.

Birthday Present

We left the Black Sea resort late in the evening. During the day we had bathed in the sea long enough to last us till the next summer. As he walked out of the water, the professor, like Archimedes who has just stepped out of his bathtub, cried out:

"Eureka!" Wiping the drops off his face, he continued:

"What we need to do now is to develop a new type of eye surgery, p o w e r surgery! Why cut the eye with a knife? This is an injury plus the risk of infection. To get to some layer of tissue, we have to destroy ten others. On the other hand, a thin beam of energy (ultrasound or laser) can give us the power to be selective and intervene in specific zones without harming others. With this

beam we could reach individual cells, encourage their activity and make them work in the required biorhythm. Finally, we could change the tissue, renew and rejuvenate it, and give it new qualities, that is make it better than nature itself made it."

"What an inveterate dreamer," I thought to myself. I have made an effort to stop that line of reasoning. So many times in recent years has he aired ideas dismissed out of hand as pie-in-the-sky and then in a couple of years those ideas have been embodied in new techniques and new types of therapy.

"We could do that not only to the eye," he continued as he towelled himself dry. "It'd be possible to regenerate the whole body. Every tissue can let some kind of energy through itself without any change and absorb another, twisting or, conversely, straightening out. If we learn the absorption spectra of all tissues, we can change their elastic qualities, stimulate the work of internal organs, and build up the size and power of muscles to make them work harder and check pathological processes in tissues in due time. The first thing to do, therefore, must be to find these absorption spectra. We need to start working together with physicists, biophysicists and physiologists. Future medicine will emerge at the junction of sciences."

He took out his pocket dictaphone and spoke into the microphone:

"Back in Moscow inquire what's been done on calculations to remove far-sightedness. Ask the boys at the computer centre why they haven't yet worked out a theoretical limit for corneal exposure to energy."

"Is there anybody in the country doing this research?" I asked him.

"I don't think so."

"How then are you going to find allies among specialists in those other fields, if there are none?"

"I'll make them interested. The topic is really fantastic. It's a problem for the 21st century."

I was sure that he would enlist their support as he had once gained the support of chemists, engineers, watchmakers, artists, mechanics and opticians for his artificial lens project.

Several months later I learned that the first operations had been performed at the clinic to reduce far-sightedness. They were based on the principles that Professor Fyodorov had outlined to me at the seaside. When the collagenous fibres of the cornea are irradiated by a generator, they become twisted and the cornea changes its optical power. As a result, far-sightedness can be reduced by as many as ten dioptres.

Professor Fyodorov is indeed hard to outdo. What surprises his long-standing colleagues is not so much the ease with which he generates his ideas but the speed with which he brings them to fruition. I have heard that from many of his colleagues and pupils. One of them told me: "We are real lucky to be working with Fyodorov. Every day there's something new. It's like intellectual fireworks. We are hardly through with one new project of his when he's suggesting something else. His projects have become increasingly daring year after year."

On Professor Fyodorov's 58th birthday, Alexander Karavayev, head of the institute's patents department, calculated that by that day Fyodorov had made 58 discoveries, one for each year of his life. A year later Professor Fyodorov had 86 inventions to his credit, one-half more than the year before.

That day, August 8, I visited him at the institute. In the morning, designers from the technology department showed him a new measuring device for myopia surgery. He liked it:

"Well done. That's the best present for me. I'm happy to see that a group with new brain power is beginning to form here. Now, with the conveyer-belt working, we'll have more time to think and generate ideas and we'll be able to look each patient straight in the eyes."

Professor Fyodorov's elder daughter, Irina, came in to wish him many happy returns. She works at the institute and specialises in corneal surgery. She had good news for him. Her dissertation had been endorsed, and she had some new ideas on how to correct astigmatism (irregularities of the cornea).

It must feel good to know that your daughter belongs to your school.

Yevgeni Dyogtev, head of the engineering department, came in to show a new model of a double-edged spear-shaped knife (one of Fyodorov's inventions).

"How do you like it," Dyogtev stretched out a hand which seemed to be empty.

"What's the width of the cutting edge?" Professor Fyodorov took the almost invisible blade.

"One micron, as you asked."

In recent years I had often heard Fyodorov say: "I need a knife thinner than one and a half microns." He was then beginning to perform operations to correct myopia and he needed special cutting instruments. A particularly sharp steel blade was developed. It had a coating that separated the tissues cut. The

new knife caused much less damage to the surrounding tissues and helped to improve the quality of operations immensely. But the sutures mended too long, three or four days.

The steel knife fell short of another requirement. It could be used only for one operation. The surgeons needed a new instrument with a cutting edge less than one-tenth of a micron. In this case a wound heals in a matter of hours, in conformity with the law of regeneration. If less than half of a cell is damaged, it can restore its integrity.

The focus was now on diamonds. Wear-resistant, they last long unless crushed. But the quality of grinding and polishing of a diamond knife achieved by the conventional abrasive method could not satisfy the surgeons. A new thermochemical method for sharpening diamonds was invented at the Yakut section of the Siberian Branch of the USSR Academy of Sciences (Yakutia is a region in Siberia).

Diamond knives are now produced serially at the experimental factory of the Institute of Eye Microsurgery. Or rather, they are sharpened to a width of under 1,000 angstroms*, while the best-quality semi-finished diamonds are supplied from other factories.

The diamond knife now has analogues made of artificial and natural materials. For instance, there is a sapphire blade. It can be used for 40 to 50 operations but costs only one-tenth the price of a diamond knife.

That day, August 8, was a usual working day for Professor Fyodorov. He consulted patients, answered endless telephone calls (of which, naturally, there were more that day than usual), read letters, did some paperwork, received foreign doctors, and performed operations.

In one hour and forty minutes his team implanted seventeen lenses on the conveyer-belt.

Putting down the instruments, Professor Fyodorov said: "Write down all the mistakes that were made today. We'll gather tomorrow to analyse them."

The automated operating room is intended only for "typical patients" to whom standard techniques can be applied. They are a majority. Some cases, however, can't be dealt with on the conveyer-belt. At the clinic I was introduced to a former pilot who had been blinded by fire. He had had as many as thirty delicate operations, each lasting several hours. After the burn, the eyes

* A unit of length equalling 10^{-10} metres.

were immured in scars and the eyelids grew together. A dozen plastic operations had to be performed before the surgeon could actually reach the eyes. Then followed a series of preparatory operations during which the mucous tissue from the patient's lip was grown to the cornea. And finally, in two stages, a prosthesis of the Fyodorov-Zuyev design was implanted in each of the man's eyes.

As he entered the operating room, the patient said each time: "Today is my twenty-third operation.?. My twenty-eighth..."

After seventeen years of complete blindness, he recovered his vision.

All thirty operations were made by Professor Fyodorov's pupil Viktor Zuyev. He attends patients in the worst condition. People who were blind for decades have to stay in clinic for a long time. Little wonder, they become friendly with their doctor, and sometimes bosom pals. Vladimir Barashkov was one patient like this.

His troubles began at the factory where he worked when hot alkali splashed out of a tank and scorched his eyes. For many months he sought help at various eye centres around the country. There were several attempts to transplant the cornea, but in vain. Three years later came another blow: his wife walked out on him. She said she had had enough. When he finally came to Professor Fyodorov, the latter told him:

"There's hardly any chance that your sight will be restored, but we'll do what we can about it."

Eight months later, Zuyev led him out into the corridor and took the dressing from his eyes. "Can you see?"

"Yes. I see a window. And a clock."

"What's the time?"

"Twenty to ten." He would remember that moment for the rest of his life. It was the time of his second birth.

Professor Fyodorov's birthday was a day like that, a day full of care for people like Vladimir Barashkov and thousands of other patients.

He spent the evening together with Irene. They switched off the telephone and during a quiet dinner he told her about the work he had done and the people he had met that day.

His younger colleagues, members of his team, had greeted him with a poem which contained these three lines:

"To help all people enjoy the light again,
To open their eyes to this beautiful world.
That is the aim of your entire life..."

Truly a mighty aim which has required so much willpower on his part. Progress to such a lofty goal is easier when a person strives to justify his existence in our world. As long as Fyodorov couldn't find the means to achieve his goal, his life, as he says himself, was uninteresting. But when he discovered a method to treat diseases that had been incurable before, his life took on a new dimension. Now he could say that he was a happy person.

Keep On Moving

So Fyodorov won out, although he might have lost as many others had before him.

Many millions are now provided by the government to build up his clinic and fit it out with the latest equipment. The Health Ministry of the USSR, the Health Ministry of the RSFSR*, and various societies and institutes are all too willing to help. The clinic is now like a pet.

What is the secret of Professor Fyodorov's rise from provincial doctor to world-famous scientist? I think the main reason is that he has always tried to provide as much assistance and to as many people as possible. His work had to be appreciated sooner or later (sooner was preferable, of course).

His colleagues often rebuke him: "Why operate so much? You are burning yourself out. It'd be quite all right if you operated one-half or even two-thirds less."

"It'd be all right with me, but what about the patients? How many of them are still waiting to be helped?"

Two and even three times more patients continue to have their surgery at Professor Fyodorov's clinic than is required. He himself is operating much more than his position calls for. He is working as much as his trained body can stand, and even more.

His patients are allies in the hard battle against mistrust. After he operated on the first 100 patients, he succeeded in opening a laboratory in Arkhangelsk. After 300 successful operations the laboratory was transferred to Moscow. After 9,000 operations, an institute was established. It is Moscow's third institute concerned with ophthalmology.

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* The Russian Soviet Federative Socialist Republic (RSFSR) is one of the 15 Union Republics making up the USSR.

The barrier of suspicion is like a sound barrier. It can be overcome when you reach a certain limit—not of speed but of the good you have done to people.

There are two dumbbells in his study, 72 lb. each. In the morning he lifts them several times. For his morning exercises, far lighter bells would do quite well. But even here he sticks to his guns. He must be sure of his strength and ability to overcome difficulties.

He wants to use as much of his natural ability as possible. Without this, he cannot be happy as a surgeon. That is why he is such a hard taskmaster, scrutinising his subordinates' work and reprimanding them singly or all together. But eventually his basic good nature wins out and, beaming on his younger colleagues, he will say:

"Come on, boys. Keep on moving. Time doesn't linger. There are patients waiting."

Long ago, he wrote this letter to a friend of his:

"...Three times a week I dash about on horseback. It gives me such a thrill. After each ride I feel several years younger. When I am in the saddle, I am delighted to know that in a matter of seconds I can make it across a field or a ravine, in a minute I can reach the far-away wood, this in any weather, however bad, even

Enjoying himself.

the deepest snow. I enjoy horse riding as you seem to become one whole with a big and warm animal, and energy flows from it to you. It feels as if you were recharged like a battery. I am sure that many diseases can be treated with the help of riding. In general, it's time for me to write a treatise on the problem. Now for the main thing. Life is gaining speed. The main problem I can't cope with is the shortage of time. It seems to me that I am always running late and that no matter what I do, I do it too slowly. I wish someone would think up some way of stretching out this darned time at least by two times. The years are beginning to flash past like telegraph poles along the road. I refuse to believe that fifty such "poles" have already flashed past. Though I am fifty years old from birth, I don't feel more than thirty-five..."

It is all part of the theory of relativity. When a system (a human being in this case) travels at a huge speed, the flow of time within this system slows down.

Professor Fyodorov is convinced that if a person lives too fast, he doesn't have the time to grow old. Ageing can be put off, and the main thing is not to give the brain any respite. When the brain works hard, it needs a lot of blood. When a person racks his brain, his entire body receives additional nourishment. A brain working hard is the key to overall human health. So the more you

Svyatoslav Fyodorov with his nephew, Arzen.

have used your brain during your life, the younger your body remains. This is the theory of relativity with regard to ageing. It is one of Professor Fyodorov's "discoveries".

"What is the most essential thing for you as a surgeon?" I asked him.

"To be absolutely sure of myself," he replied.

This is far from a universal quality. Many people lack confidence and are rent by doubts about the success of whatever step we might be making. I, for one, constantly have this feeling. It lets go only after some infrequent success, and only for a short while. But he is unfailingly sure of himself. Where does he get that quality?

I think that it comes from his trying to achieve something impossible, from his determination to overcome himself.

"To me, life is like scaling a summit," he once told me. "You are climbing up, you know that the summit is still some distance away, and this makes you take chances, fall down, your hands bleeding and your eyes sun-scorched, but you keep moving to your goal. When we talk of medicine, we say that it must be humane and effective. Can one be humane towards several dozen patients and be considered a good doctor? Is this fair? After all,

one can be humane to thousands of patients, and that's what we are trying to achieve with our new techniques. Medicine can't be abstractly humane. Its humanity must be practical. I'm sure that some day the performance of hospitals will be judged by how much good they do per unit of time with the same number of doctors."

At Professor Fyodorov's institute 20,000 operations are performed annually, the world's highest rate. Professor Kirmani, an ophthalmologist from Pakistan, has told me: "I've been to all the best eye centres in the world but I've never seen such a scope as here."

After an automated polyclinic is built (you enter the building and sit down in a mobile arm-chair which will take you to all specialists, without any queues and with gentle music playing; the consultation will be over in two hours, with a computer print-out listing the diagnosis and the proposed treatment; meanwhile, you'll find yourself in a lounge where you can have a cup of tea or coffee), and after a convalescent centre is built, another conveyer-belt can be started. Professor Fyodorov hopes that his "boys" will then be doing 40,000 operations a year. Enough to provide exhaustive eye care in a city of ten million residents.

All thirteen branches of the complex are to be completed by the year 1990. They will offer conveyer-belt surgery at a rate of 250,000 operations a year. In just five years one million people will have their eyesight improved.

The complex will make it possible to upgrade the level of surgical treatment of mass-scale eye diseases, including cataracts, glaucoma, myopia, far-sightedness, and astigmatism. Patients with these disorders occupy almost half of all beds at eye clinics in the Soviet Union. The complex will rid the clinics of that burden and will enable eye specialists to perform more sophisticated surgery and create new techniques for other grave diseases of the eyes. Professor Fyodorov explains:

"In the next two years we'll boost our efficiency. I plan that by 1990 we'll be able to cater for up to a quarter of a million patients a year, which means 1,200 to 1,300 operations a day, or one highly sophisticated operation every 30 seconds."

Professor Fyodorov has calculated that if the world's ophthalmology is placed on a conveyer-belt basis, only 65 such complexes will be needed to cure all eye patients in the world. They will cost the 6,000 million dollars currently spent on just two nuclear-missile submarines. It is as simple as that. Without those two submarines, the world could defeat blindness.

He was called an adventurer when he set out to start a conveyer-belt for eye surgery.

Leonid Linnik, Professor Fyodorov's science deputy, has told me:

"I didn't believe in the conveyer-belt project. Many others at this institute doubted that it could be done. It'd be a lie if they said they had been all for it. But Fyodorov did believe that he'd succeed. When a person wants to help other people as much as he can, he becomes omnipotent. Some are saying now: 'Well, he's got all the support he could use. He might start putting on airs.'"

No, he doesn't have the time for that. There are new obstacles ahead. One can still hear sceptical voices:

"An automated polyclinic? A patient in a mobile chair? That's absurd. An operating robot? That's dehumanisation of medicine."

Factory manager Georgi Umnov, one of Fyodorov's best friends, has told me the following. When Fyodorov came to his factory the first time, he was taken to a swimming pool (considering his devotion to swimming). He saw a ten-metre diving platform, climbed it, made a handstand on the board and ... went down. Some of those present closed their eyes and he popped out of the water, smiling: "Good jump, wasn't it?"

It is this striking combination of militant kindness and boyish mischief that has formed a remarkable character.

Keep on moving, boys!

Epilogue

I heard the clatter of hoofs. It was too early for them to return. Arzen, riding Shah, came into view. Grom was following behind but without the rider.

Arzen jumped off the horse and ran up to Irene, weeping: "Don't be scared. He fell into grass. It is soft there. But he wouldn't rise. He lay still."

"Where is he?" Irene turned pale.

"I don't know," the boys said, weeping. "He said: come on, let's race to that haystack. We raced off. But there were hollows all around. Our horses collided and he fell, head down. But there is grass. Grom went away and I wanted to catch him and take

him back to Uncle Slava. I overtook him just now. But don't be scared. The earth is soft there."

"Where's that place? Try to remember, Arzen."

"I can't. Grom kept me going too long."

I was beginning to think the worst. What if he had broken his neck.

"We must go to Sergei Dorensky. He's got a car."

Sergei Dorensky, Dean of Moscow Conservatory and a kind man always ready to lend a hand, lived next door. Buttoning up his shirt as he walked to his car, he grumbled: "I knew there'd be trouble."

We were hardly past the gate when we saw him coming our way, his face dark. He saw the boy: "Where on earth did you go? You betrayed me." Arzen was weeping soundlessly, his arms pressed against his sides, his eyes closed.

"I thought I was doing the right thing," he uttered at last. "I wanted to take Grom back to you."

I could see that Fyodorov was about to stroke the boy's head or embrace him, but he walked away in silence. For half an hour he pretended not to see the boy. This was the worst punishment. But he did not endure long.

"Arzenushka*, have you seen Grom's gear?" he shouted suddenly. The boy dashed across the yard, as if on wings, beaming.

"Here it is, Uncle Slava," he cried out and dashed back.

"Fine. Off we go, boys!"

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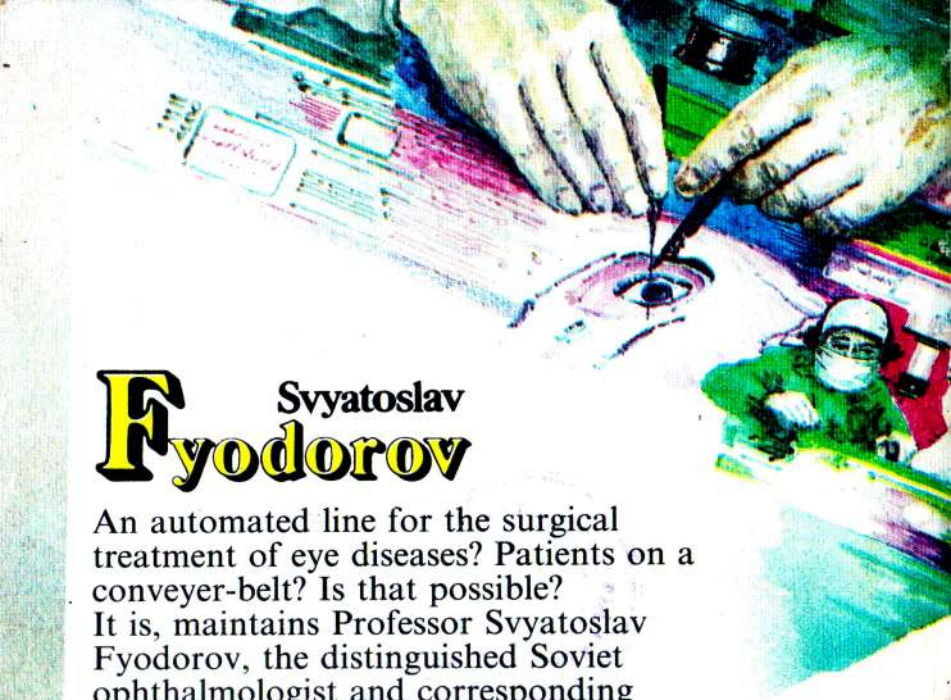
* Diminutive from Arzen.



Svyatoslav Fyodorov

An automated line for the surgical treatment of eye diseases? Patients on a conveyer-belt? Is that possible?
It is, maintains Professor Svyatoslav Fyodorov, the distinguished Soviet ophthalmologist and corresponding member of the USSR Academy of Medical Sciences.
His talent and ideas have restored vision to thousands of people. Since 1986 a Research and Technological Complex of Eye Microsurgery has been operating in the Soviet Union with thirteen branches in various cities. Professor Fyodorov is general director of the complex.
For his outstanding achievements, Professor Fyodorov in 1986 merited the highest award of the USSR Academy of Sciences, the Mikhail Lomonosov Medal.
In 1987, the scientist was granted the title of Hero of Socialist Labour—the highest decoration in the USSR for outstanding services to the state.
In September 1988 Professor Fyodorov was elected Chairman of the newly-established Soviet Charity and Health Fund.